SHAME AND SELF-COMPASSION IN PREDICTING WEIGHT LOSS MAINTENANCE AND WEIGHT REGAIN IN OBESITY

by © Kerri Bojman

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Abstract

Obesity is a serious health condition characterized by excess adiposity and associated with physical and mental health difficulties (Health Canada, 2003; Petry, Barry, Pietrzak, & Wagner, 2008; Tjepkema, 2006). Among individuals with obesity who successfully lose weight, most individuals are unable to sustain their weight loss over time (e.g., Kramer, Jeffrey, Forster, & Snell, 2010).

Weight regain has been associated with psychological variables including weight stigmatization, depression, binge eating, and emotional eating (Ashmore, Friedman, Reichmannm & Musante, 2008; McGuire, Wing, Klem, Lang, & Hill, 1999; Konttinen et al., 2010; as cited in Kemp, Bui, & Grier, 2013; Sutin & Terracciano, 2013). Shame, an aversive emotion focused on one's sense of self, has been strongly associated with these variables (American Psychiatric Association, 2013; Conradt, Dierk, Schlumberger, Rauh, Hebebrand, & Rief, 2007; Wong & Qian, 2016). However, the role of shame in relation to weight loss maintenance over time in a community sample of individuals with obesity has yet to be fully explored.

Recently, self-compassion has been identified as being an important counterbalance to shame. Compassion-focused therapy (CFT) is based on a biopsychosocial model of affect regulation that proposes treating oneself compassionately may counteract negative feelings, such as shame, that are thought to underlie maladaptive behaviors (Gilbert, 2010). CFT interventions have been shown to decrease disordered eating behaviours, such as binge eating, in clinical samples (Gale, Gilbert, Read, & Goss, 2014).

This study investigated whether compassion-focused interventions that have been found to be effective in clinical eating disordered populations may be helpful for subgroups in obese populations who struggle with high shame and unhelpful eating behaviours that interfere with weight loss maintenance. It was hypothesized that greater levels of baseline shame would predict weight regain and greater levels of self-compassion would predict weight loss maintenance.

Seventy-one adults (males = 26, females = 45) who were obese and had recently lost at least 5% of their body weight through behavioural methods were recruited from the community. At baseline, six months, and twelve months, participants completed questionnaires pertaining to depression, shame, self-compassion, emotional eating, and binge eating. Participants' body mass index was also calculated at each time point.

Results were opposite to initial predictions. After initial weight loss, baseline shame predicted weight loss and weight loss maintenance. Over time, this relationship weakened. Conversely, following initial weight loss self-compassion predicted weight regain. Over time, this relationship disappeared. Novel subgroups of individuals were found who reported positive effects of shame and negative effects of self-compassion on weight loss maintenance, particularly at six months. Results further indicated that baseline emotional eating played a critical role in moderating the relationship between shame and weight change, as baseline shame predicted weight regain at higher levels of emotional eating but predicted weight loss at lower levels of emotional eating.

This research clarifies the roles of shame and self-compassion in relation to weight loss maintenance and weight regain over time. This study illustrated that not all individuals in the community show the same relationships between shame, self-

compassion, and weight regulation. Based on these findings, future research can assess whether subgroups of individuals in obese populations who engage in high levels of emotional eating may benefit from CFT interventions for weight loss maintenance.

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Introduction

Obesity

Obesity is a serious health condition characterized by excess adiposity (Health Canada, 2003). It is considered to be a product of complex genetic, biological, behavioural, and psychological factors (Grilo & Pogue-Geile, 1991). Obesity has been related to chronic physical health problems including heart disease, diabetes, and hypertension (e.g., Tjepkema, 2006), and elevated rates of certain mental health disorders including mood disorders (Petry, Barry, Pietrzak, & Wagner, 2008) and social anxiety disorder (Ostrovsky, 2013). The physical and mental health problems associated with obesity contribute to an increased reliance on medical services, and an economic burden in Canada of $6 billion (Anis, Zhang, Bansback, Guh, Amarsi, & Birmingham, 2011). The impact of negative social stigma associated with obesity is thought to influence the health related quality of life of obese persons (Stern, Mazzeo, Gerke, Porter, Bean, Laver, & ... Young-Hyman, 2007). In Canada, between 2007-2009 24% of adults were obese (Statistics Canada, 2010). Newfoundland and Labrador has the highest rate of obesity in all of Canada at 34% (PHAC, 2011). Alarmingly, rates of obesity are on the rise and obesity verges on gaining status as a global epidemic (World Health Organization, 1998).

Obesity is defined as a high Body Mass Index (BMI: Health Canada, 2003). BMI is thought to be an acceptable approximation of total body fat for the majority of individuals (National Institute of Health: NIH, 1998). BMI is calculated by dividing body weight (in kilograms) by height (in meters) squared (Health Canada, 2003). According to Health Canada guidelines and the World Health Organization, the classifications for BMI are as follows: less than 18.50 (underweight); 18.50 to 24.99 (normal weight); 25.00 to

29.99 (overweight); 30.00 or greater (obese). Health Canada states that normal weight represents the least health risk, with underweight, overweight, and obese weight ranges representing increased health risks, respectively (Health Canada, 2003). Within the obese classification, health risks range from 30 (high) to ≤ 40 (extremely high). BMI is a recommended measure of health risk due to the widely replicated positive relationships between BMI, morbidity, and mortality across multiple experimental studies (e.g., NIH, 1998). Furthermore, BMI's strong practical utility (i.e., simplicity of measurement, cost-effectiveness, and wide generalizability) makes it a popular form of health risk assessment (NIH, 1998).

Although the use of the BMI system to represent health risk is widely recognized, its use is controversial. Being overweight (BMI of 25-29.99) has been associated with significantly lower mortality overall relative to normal weight in some studies (BMI of 18.50-24.99; Flegal, Kit, Orpana, & Graubard, 2013). Furthermore, researchers have criticized that health professionals have failed to take into account the role of gender or culture while assessing BMI; specifically, that males tend to have lower body fat percentages than females (Singer-Vine, 2009), and Asian populations tend to have lower BMIs on average than Caucasians (Deurenberg, Deurenberg-Yap, & Guricci, 2002). Although findings are inconsistent, national institutions such as the National Institute of Health have recommended the use of BMI to assess overweight and obesity (NIH, 1998). Thus, the majority of research pertaining to weight and health has employed the use of the BMI categorical system to broadly assess health risk.

Treatment of obesity. Obesity has been treated utilizing pharmacological, surgical, and behavioural interventions. It is recommended that tracking changes in body

weight alone can be used to determine the efficacy of treatment (NIH, 1998). The goal for most university-based weight loss interventions is a 5-10% reduction in weight (Cooper & Fairburn, 2001). This is because, among obese populations, a 5-10% reduction in weight is associated with clinically meaningful health benefits (Cooper & Fairburn, 2001). For example, a 5-10% reduction in weight has been associated with a decrease in coronary heart disease risk factors (Wing & Jeffery, 1995). Health benefits from 5-10% weight loss are thought to be sustainable if weight regain does not occur (Wing & Jeffery, 1995). Due to the improved health benefits associated with weight loss of this magnitude, maintaining a weight loss of $\geq$5% of one's initial weight for at least one year has been incorporated in national guidelines for evaluating the effectiveness of weight-management programs (e.g., US Institute of Medicine, 1995; as cited in Cooper & Fairburn, 2001).

A review of pharmacological treatments for weight loss has estimated that drug interventions can result in weight loss of approximately 10% (Bray & Ryan, 2011). However, the majority of weight loss drugs have not been deemed appropriate for long-term use. In addition, weight-loss drugs are associated with adverse side effects such as increased blood pressure, constipation, and insomnia. Other side effects can include drug overuse, drug misuse, and relapse (Aronne, 2002). As such, physicians typically only prescribe weight loss medications to individuals who are at a significant medical health risk from their obesity and have not responded to management of their obesity through diet, exercise, and behavioural change (Aronne, 2002).

Surgical treatments, such as gastric bypass surgery, have been associated with substantial weight loss (<15%; Torgerson & Sjostrom, 2002) and are recommended by

health professionals for reducing weight in severely obese individuals for whom their condition poses extreme health risks (e.g., National Institute for Health and Clinical Excellence, United Kingdom; as cited in Bray & Ryan, 2011). Invasive surgical treatments either limit the stomach's capacity for food, and/or interfere with digestion (Pories & Beshay, 2002). While surgical treatments can result in dangerous side-effects post-surgery (e.g., approximately 5% of patients undergo adverse complications within the first 30 days post-operation; Colquitt, Picot, Loveman, & Clegg, 2009), they are effective in producing large weight losses and are associated with reductions in mortality and morbidity associated with extreme obesity (Chang & Wittert, 2009). However, there appears to be a high rate of weight regain following bariatric surgery after the two year follow-up, with 20-35% of patients demonstrating failure of weight loss maintenance at the 10 year follow-up (Christou, Look, MacLean, 2006). Furthermore, although surgery has been associated with positive physical changes (e.g., increased physical abilities), it has also been associated with a variety of psychological complications such as increased body image dissatisfaction due to excess skin folds (Bocchieri, Meana, & Fisher, 2002). Many postoperative individuals express increased feelings of vulnerability and low self-esteem from realizing that some personal struggles preoperatively blamed on weight (e.g., lack of comfort in intimate relationships) persisted after weight loss (Bocchieri et al., 2002). While surgery is a viable option for severely obese persons, it is clear that it is not a quick "fix-all" solution for individuals struggling with the physical and emotional consequences of obesity.

The most common approach for treating obesity is behavioural treatment. Behavioural treatment typically involves restricting food intake (e.g., 1500 calories per

day or less) and increasing physical activity level (Wilson & Brownell, 2002). They usually employ the use of a calorie-restricted diet and 20-40 minutes of moderately vigorous physical activity based on 70% of maximal heart rate three to five times a week (Blair & Holder, 2002). A calorie-restricted diet produces greater initial weight loss than exercise alone; however, the combination of diet and exercise produces overall greater weight loss (Blair & Holder, 2002).

Obesity and mental health. While the literature is equivocal in delineating relationships between obesity and mental illness, obesity has been associated with variables related to psychological distress such as negative affect (Pasco, Williams, Jacka, Brennan, & Berk, 2013). Individuals with high negative affect experience a variety of aversive mood states including anger, guilt, nervousness and fear (Watson, Clark, & Tellegen, 1998). Greater negative affect scores have been associated with increasing levels of BMI, such that individuals with obesity are more likely to have higher negative affect scores than individuals who are overweight (Pasco et al., 2013). Across the mental health literature, it appears that the only consistent difference between obese and non-obese persons is degree of body image distress (Rosen, 2002). Obese persons report greater body image distress, are less satisfied and more preoccupied with their physical appearance, and more avoidant of social situations (Rosen, 2002).

Obesity, body image distress, and weight-based stigma. Obese persons' body image distress has been related to weight-based stigma (Rosen, 2002). Weight-based stigma is a negative social bias that can stereotype and portray obese people in a negative light including being unpleasant, stupid, overindulgent, unhappy, or lazy (Puhl &

Brownell, 2006). Stigmatizing experiences, such as being the target of hurtful or derogatory comments, are frequent experiences among obese persons (Rosen, 2002).

Anti-obesity attitudes consist of disliking obese persons, assuming obese persons have no will-power, and having a fear of fat (Crandall & Schiffhauer, 2013). Social ideology models of weight-based stigma suggest that stigmatized attitudes towards obese individuals in our society occur because common negative social assumptions about being overweight appear to oppose the North American values of self-determination, individualism, and self-discipline (Crandall & Schiffhauer, 2013). As obesity is thought to result from behaviours reflecting one's value system, the 'blame' for obesity is falsely placed directly on the individual (Crandall & Schiffhauer, 2013).

Weight stigmatization has been shown to be positively correlated with symptoms of psychological distress (Puhl, Moss-Racusin, Schwartz, & Brownell, 2008; Rosen, 2013). A large online qualitative study investigated self-reported emotional consequences of weight stigmatization in 318 overweight and obese persons (Puhl et al., 2008). Participants reported detrimental emotional consequences of stigmatizing experiences, such as their relationships suffering as a result of weight stigmatization (7.5%), depressed mood (18.6%), and hurt, embarrassed, and sad feelings (6.3%, 5.7%, and 5.3%, respectively). Participants reported that although sources of stigma included peers, strangers, and health care professionals, the worst stigmatizing encounters are often with close relationship partners such as friends, parents, and spouses (Puhl et al., 2008). These stigmatizing encounters may be experienced as more hurtful than with non-close others (Puhl et al., 2008). Puhl's et al.'s study suggests that weight stigmatization negatively affects the emotional well-being of obese persons.

The adverse effects of weight-based stigma are not limited to mental health; rather, they appear to have severe psychosocial repercussions. In the workplace, overweight persons are less likely to be hired for employment in comparison to their thinner co-workers, and if hired, they receive less pay for their work (Puhl & Brownell, 2002). In healthcare, negative attitudes towards obese persons likely inhibit obese persons from seeking necessary medical treatment (e.g., BMI is positively related to appointments cancellations for breast and gynecological exams; Puhl & Brownell, 2002). In the educational system, obesity has been associated with multiple forms of weight discrimination (e.g., peer rejection at school; Puhl & Brownell, 2002). The literature suggests that negative attitudes towards obese persons significantly influence and impact functioning across key domains of living (Puhl & Brownell, 2002).

Weight stigmatization is often justified as a way to encourage obese individuals to lose weight (Sutin & Terracciano, 2013). However, a growing body of research suggests that weight stigmatization does not work, and may in fact pose an increased risk for obesity. In a longitudinal study assessing relationships between BMI and weight discrimination over time, participants who were not obese at baseline and experienced weight discrimination were approximately 2.5 times more likely to be obese by follow-up than participants who did not experience weight discrimination. Participants who were obese and who experienced weight discrimination were over three times more likely to remain obese at follow-up compared to participants who did not experience weight discrimination (Sutin & Terracciano, 2013). Relationships were not moderated by demographic factors including age, sex, ethnicity, or education. Results suggest that

weight discrimination as a tool for combating obesity is both ineffective and detrimental for weight loss.

The strategies that individuals use to cope with weight discrimination may play an important role in explaining the positive relationship between weight discrimination and BMI. In a large community sample of 2671 participants, researchers examined relationships between BMI, weight stigmatization, psychological distress, coping strategies, sources of stigma, and eating behaviours (Puhl & Brownell, 2006). Higher BMI was associated with more frequent exposure to stigma and more attempts to cope. While participants used a variety of strategies to cope with weight-based stigma (e.g., positive self-talk or therapy), one of the most common strategies used to cope with weight-based stigma was to 'eat more'. Related research suggests eating in response to negative emotions may function to achieve greater affect regulation (e.g., Telch, 1997). These results suggest that weight discrimination as a tool for promoting weight loss may actually promote increased engagement in eating behaviours; likely increasing one's vulnerability for future weight gain (Puhl & Brownell, 2006).

Costs associated with weight loss. Obesity is associated with both increased health risks and increased body image distress due to weight stigmatization. Thus, some individuals make costly financial sacrifices and devote significant periods of time towards weight loss efforts. In 2013, the United States profited from a $49 billion-a-year diet industry (NAAFA, 2013). Individualized diet plans can cost up to $725.00 per month (Kirk, 2010) and a one-year gym membership can cost $750.00 per year (Goodlife, 2013). The cost of meal replacement supplements and additional weight loss alternative

treatments can be high. Weight loss through commercial methods can require large financial and personal sacrifices.

"Take it off and keep it off" claims are fairly common for commercial diet plans; 41% of all advertisements promise long-term weight loss maintenance (Cleland, Gross, Koss, Daynard, & Muoio, 2002). However, limited research has been able to assess the success of commercial diet plans for weight loss maintenance, as most commercial diet companies fail to keep the follow-up data necessary for the analyses (Rosenthal, 1992). Available research suggests that many participants in commercial weight loss programs (e.g., Curves) achieve significant weight loss in the first six months; however, many of them regain the weight in the longer term (e.g. Greenlee, Crew, Mata, McKinley, Rundle, Zhang, &…Hershman, 2013; Truby, Baic, deLooy, Fox, Livingstone, Logan, & ... Millward, 2006).

Individuals struggling with obesity tend to significantly underestimate their caloric consumption by 47±16 % and overestimate their energy expenditure by approximately 19% (Lichtman, Pisarska, Berman, Pestone, Dowling, Offenbacher, & ... Heymsfield, 1992). Thus, commercial meal replacements were produced to provide dieters with a detailed description of their caloric intake in order to reduce overall caloric overconsumption (Berkowitz, Wadden, Gehrman, Bishop-Gilyard, Moore, Womble, & ... Xanthopoulos, 2011). These food products include liquid shakes, frozen entrees, or snack bars (Berkowitz et al., 2011). Limited research has assessed the effective of meal replacements in facilitating weight loss maintenance; however, it appears that meal replacements (i.e., SlimFast) do not facilitate weight loss maintenance any more than consuming a calorie restricted diet (Berkowitz et al., 2011).

It appears that many obese persons waste time and money on commercial weight loss plans, treatments, and products that do not seem to work in the long run. The high financial, emotional, and physical costs associated with weight loss through commercial venues do not appear to be always worthwhile. And yet, some individuals are able to maintain weight loss over time using either commercial or non-commercial methods. Individual differences between weight regainers and weight loss maintainers may further elucidate predictors of weight loss maintenance.

Studies on Weight Loss Maintenance

Prevalence of weight loss maintenance across clinical and community samples. Weight loss maintenance has been assessed in both clinical and community populations. Methodologies used to investigate weight loss maintenance appear to differ between the two populations. Clinical studies are usually cross-sectional or longitudinal. They typically recruit a small number of participants to participate in structured weight loss programs and their weight is monitored over time. Community studies are typically cross-sectional, self-report, large-scale health surveys. Limited research has compared clinical and community samples to determine patterns of weight regain and weight loss maintenance. However, the literature suggests that clinical samples might have lower rates of weight loss maintenance than community studies (e.g. Blissmer, Riebe, Dye, Ruggiero, Greene, & Caldwell, 2006; Weiss, Galuska, Kettel Khan, Gillespie, & Serdula, 2007). The sample characteristics of both populations might play a key role in explaining this finding. Blissmer, Riebe, Dye, Ruggiero, Greene, and Caldwell (2006) compared psychopathology measures taken from a clinical weight loss sample to age-specific population norms. The clinical sample (n = 91) was similar to population norms on most

measures, including physical functioning, general health, and social functioning. However, the clinical sample demonstrated significantly higher bodily pain indexes and significantly worse mental health scores than population norms (Blissmer et al., 2006). This study suggests that individuals who present for a clinical weight loss intervention program might have significantly more mental health difficulties than the general population, and these difficulties may interfere with their ability to maintain weight loss over time.

Findings from clinical samples. In 1958, one of the first longitudinal studies assessed weight loss and weight loss maintenance among 100 obese participants enrolled in an outpatient clinical weight loss program (Stunkard & McLaren-Hume, 1959). Weight loss was defined as losing at least 20 pounds, and weight loss maintenance was defined as maintaining this weight loss at two year follow-up. Participants were instructed to follow very low calorie diets ranging from 800-1500 calories per day. Findings showed that the attrition rate for follow-up appointments was very high (28%) and overall results were discouraging. Out of all the participants who completed the study, only twelve participants lost 20 pounds at any time during the two years, and only one participant lost 40 pounds or more. Only six participants were successful in maintaining their weight loss after one year and only two participants were successful after two years of treatment (Stunkard & McLaren-Hume, 1959).

This pivotal study has been influential in conceptualizing obesity as a chronic condition that is very difficult to treat (Wadden, 1993). The researchers have been widely quoted as claiming that, “most obese persons will not stay in treatment for obesity, of those who stay in treatment, most will not lose weight, and of those who do lose weight,

most will regain it" (Stunkard & McLaren-Hume, 1959; as cited in Wadden, 1993). However, it is noteworthy that this study occurred prior to the behavioural therapy movement in the 1960s (Wadden, 1993). Behavioural interventions, such as exercise and self-monitoring, are currently used in most structured weight loss programs. For example, a recent study of 76 obese participants enrolled in very low calorie diet and behavioural therapy weight loss programs found that approximately 50% of participants lost an average of ~ 20 pounds after six months of treatment (as opposed to Stunkard & McLaren-Hume's finding of 12%; Foster, Wadden, Peterson, Letizia, Bartlett, & Conill, 1992**).** After excluding eight participants during data analysis due to medical reasons, attrition was found to be fairly low with 61 out of 68 participants (~90%) completing the study **(**Foster et al., 1992). Behavioural interventions appear to have radically altered therapeutic outcomes for weight loss and weight loss maintenance.

Recent research suggests that weight loss maintenance is possible. However, it appears that weight loss maintenance is sustainable for many participants only in the short-term. Weight regain generally occurs within one to five years of weight loss (Wadden & Stunkard, 1986; Wadden, Stunkard, & Liebschutz, 1988; Wadden, Sternberg, Letizia, Stunkard, & Foster, 1989). At the five year follow-up, it has been found that less than 10% of obese individuals who take part in clinical studies are able to sustain meaningful weight loss (Kramer, Jeffrey, Forster, & Snell, 2010). These results are discouraging, as they suggest that few obese individuals who participated in clinical weight loss studies are able to maintain their weight loss goals.

High rates of eventual weight regain seem to be consistent across various forms of clinical interventions, including following a very low calorie diet or engaging in

structured behaviour therapy program (Wadden & Stunkard, 1986). Weight regain has been shown to occur even when various clinical interventions have been used in conjunction with one another (Blissmer, Riebe, Dye, Ruggiero, Greene, & Caldwell, 2006; Wadden & Stunkard, 1986). In 2006, Blissmer, Riebe, Dye, Ruggiero, Greene, and Caldwell recruited 190 obese participants to partake in a six month clinical program that consisted of weekly exercise regimes, nutritional education, and behavioural counselling. Follow-up assessments occurred at 12 and 24 months. Out of the 91 participants, only 27 participants (30%) had maintained a weight loss of at least 5% at the two year follow-up (Blissmer et al., 2006). However, the study had a low follow-up response rate with only 91/190 participants (~48%) returning for the 24 month follow-up, so the results are difficult to interpret.

Findings from community samples. One of the largest community studies to date occurred between 1999-2002 in the U.S.A. The National Health and Nutrition Examination Survey (NHANES) was distributed to American civilians. NHANES used a stratified, multistage probability sampling design. The survey asked participants (N = 1310) questions regarding their weight history to determine the prevalence and predictors of weight regain and weight loss maintenance. Inclusion criteria included adults age 20-84 who reported a BMI >25, and had experienced a weight loss of at least 10% lower than their self-reported maximum weight. The response rate was 83%. Results demonstrated that although 33.5% (n = 427) had regained weight in the past year, 58.9% (n =785) had maintained their weight loss at the one-year follow up (Weiss, Galuska, Kettel Khan, Gillespie, & Serdula, 2007). It is important to note that the retrospective design of this study may be subject to memory biases of the participants. Furthermore,

the inclusion criteria may pose a selection bias, as individuals who can recall specific changes in their weight history may be more prone to self-monitor their weight; a key component of many weight loss programs. However, despite the limitations of this study, these results suggest that many individuals in the general populations are generally successful at maintaining weight loss goals for at least one year.

In another community-based study, McGuire, Wing, & Hill (1999) used cluster sampling to recruit a nationally representative sample of adults from the U.S.A (*N* = 500). A telephone interview was used to screen participants and gather data regarding their weight history. Participants were predominantly middle-aged, Caucasian, and had obtained at least a high school education. Out of the 474 participants who reported their weight history, 225 participants reported previously losing at least 10% of their weight; a weight loss that has been associated with significant health benefits (Goldstein, 1991). One-half to two-thirds of this sample reported the weight loss to be intentional. Out of these 225 participants, 110 participants (43 %) reported maintaining this weight loss for an average of 7.9 ± 9.65 years. Results from this study suggest that in the community, a substantial proportion of individuals who lose weight are able to maintain their weight loss for many years (McGuire et al., 1999). The study further suggests that previous statements about the failure of weight loss programs in clinical samples may not apply to community samples (e.g., Stunkard & McLauren-Hume, 1959). Despite these promising results, the study researchers report several limitations regarding the generalizability of the study including reliance on participants' self-reports and failure to assess intentionality to lose weight (McGuire et al., 1999).

Related survey research has assessed how individuals in the community prefer to lose weight and maintain their weight loss. In a 2013 survey conducted by Consumer Reports magazine, 9000 participants were asked about diet plans they had been on during the past three years. Researchers assessed the amount of weight that the dieters lost and participants' overall satisfaction with their diet plans on 13 commercial (e.g., Weight Watchers) and do-it-yourself (e.g., using a phone app) diet plans. All of the diets produced significant weight loss, ranging from 5-40 pounds for women and 10-43 pounds for men. In general, do-it-yourself weight loss programs (such as using free smart-phone apps) scored highest for participant satisfaction for weight loss maintenance and aid with lifestyle changes. Results from this large-scale study suggest that individuals in community samples prefer to lose and maintain weight loss without formal interventions.

Behavioural perspectives on weight-loss maintenance. As reviewed above, there is evidence that a significant proportion of people who lose weight are able to maintain the weight loss. Behavioural approaches to weight-loss maintenance suggest that three behaviours strongly associated with long-term weight loss maintenance include 1) on-going adherence to a calorie-reduced diet, 2) engaging in frequent physical activity, and 3) self-monitoring (Wadden, 1995; Hill, Wyatt, Phelan, & Wing (2005). The diet of weight loss maintainers usually consists of low-calorie foods that are high in carbohydrates and moderately low in fat, as well as consuming breakfast every day (Hill et al., 2005). This diet is usually accompanied by frequent physical activity; in particular, walking is a commonly used exercise (Hill et al., 2005). Self-monitoring refers to paying attention to one's own thoughts and behaviours, and the conditions under which they

occur (Bandura, 1991). Self-monitoring of one's current state provides a benchmark against which to measure future performance. Thus, self-monitoring is thought to be a prerequisite for necessary skills (e.g. goal-setting) associated with behavioural change (Mezo, 2009; Rehm, 1977). For example, if an individual wishes to become more physically active, he can monitor his current level of exercise in order to determine what subsequent steps are necessary to reach his fitness goals (Mezo, 2009).

Self-monitoring has been used in various formats. Traditionally, weighing oneself has been shown to be an effective self-monitoring behaviour. In 2007, Butryn, Phelan, Hill, & Wing (2007) assessed a community sample of overweight and obese participants who managed to maintain their weight loss at the one year follow-up (n = 2462). The researchers aimed to determine whether baseline self-weighing frequency or changes in self-weighing frequency behaviour over time were predictive of weight regain at the one year follow-up (Butryn et al., 2007). Results indicated that maintaining or increasing self-weighing over time was predictive of less weight regain. These results held even while controlling for confounding variables (i.e. disinhibition and cognitive restraint; Butryn et al., 2007).

Recently, online self-monitoring applications have also been shown to be effective weight loss interventions. In 2013, Krukowski, Harvey-Berino, Bursac, Ashikaga, & West assessed the effectiveness of a six month manualized online behavioural weight loss intervention. One hundred and sixty-one overweight and obese persons were divided into groups of 12-18. Each group met for one hour per week in an online chat room. As part of their treatment, all participants were required to record their daily dietary intake, minutes of physical activity, and weight in an online journal.

Participants also had access to an online calorie-monitoring database and received weekly individual counsellor feedback on their self-monitoring activities. Consistent self-monitoring (equal or greater than 6 days per week) predicted greater weight loss at six months, particularly for individuals who consistently self-monitored early on in the program (Krukowski et al., 2013). Although results suggest that online self-monitoring applications may be promising interventions for weight loss, potential limitations to this study include the sample characteristics that generate questions about the generalizability of the findings. The inclusion criteria were access to a computer and the internet, and the exclusion criteria were a history of medical or psychiatric illnesses (Krukowski et al., 2013). Thus, the sample may not be generalizable to individuals from a lower social economic status who do not have access to a computer, or to individuals with physical or psychological disorders who present at clinical weight loss programs.

A recent American health survey determined that several behaviours are specifically associated with weight loss maintenance and not weight loss. Participants recruited for the study (N = 1165) had lost at least 30 pounds, and kept the weight off for at least one year. Researchers asked participants which 36 weight-control behaviours (e.g. exercising, planning meals ahead of time, etc.) they practiced in the past week. Four highly used behaviours were found to be specifically related to weight loss maintenance and not weight loss. These four behaviours included: 1) consuming low-fat sources of protein, 2) following a consistent exercise routine, 3) rewarding yourself for sticking with your diet plan or exercise plan, and 4) reminding yourself why you need to control your weight (Sciamanna, Kiernan, Rolls, Boan, Stuckey, Kephart, & ... Dellasega, 2011). Other highly used behaviours, such as weighing yourself, were associated with both

weight loss and weight loss maintenance. This study indicates the importance of diet and physical activity specifically for weight loss maintenance, and further supports the importance of self-monitoring for both weight loss and weight loss maintenance.

In summary, research findings suggest that eating a calorie-reduced diet, engaging in frequent physical activity, and employing self-monitoring behaviours aid with weight loss maintenance. Yet, it is unclear why some individuals are able to maintain these behaviours over time, while others are not. Recently, biological, cognitive, and emotional perspectives on weight loss have contributed to the obesity literature, and propose several salient factors that may interfere with weight loss maintenance.

Biological perspectives on weight-loss maintenance. Biological perspectives suggest that an individual's physiology might interfere with their ability to maintain weight loss (MacLean, Bergouignan, Cornier, & Jackson, 2011). Biological hormones, including adiposity hormones (i.e., leptin and insulin) and gut peptide signals (e.g., peptide tyrosine tyrosine), skeletal-muscular factors, and organs including the liver are thought to play salient roles in influencing weight regulation (MacLean et al., 2011). Biological perspectives propose that during weight loss, body weight homeostasis is disrupted. In order to maintain the weight loss, weight loss strategies must be maintained indefinitely as homeostatic mechanisms do not 'reset' at a lower weight. If weight loss maintenance strategies are not maintained, biological factors drive weight regain (MacLean et al., 2011). Other physiological adaptations that occur during weight loss are thought to influence weight regain. For example, during weight loss adipocytes (fat cells)

shrink. Smaller adipocytes demonstrate greater sensitivity for energy storage during overfeeding, and trigger hormones to regain weight (MacLean et al., 2011).

Another line of research suggests that unhealthy foods (i.e. highly processed, hyper-palatable foods) triggers neurobiological reactions similar to those triggered by addictive drugs, causing some individuals with a propensity for addictions to struggle with adhering to a healthy diet (Gearhardt, Corbin, & Brownell, 2008). These individuals demonstrate 'food addiction' symptoms (i.e., compulsive overeating) that parallel symptoms of substance dependence (Davis & Carter, 2009). Thus, biological perspectives claim that performing behaviours necessary for weight loss maintenance might be difficult if one's physiology is hypersensitive to food restriction or weight loss, or if one has a propensity for 'food addiction'.

Cognitive perspectives on weight-loss maintenance. Although biological perspectives have contributed to understanding weight regain, there is still a lot of unexplained variance in determining weight loss maintenance (e.g., not all obese individuals compulsively overeat). Cognitive perspectives propose that some maladaptive behaviours (e.g., compulsive overeating) occur due to irrational or distorted thought processes. Thus, certain cognitive variables could enhance or impede one's ability to maintain weight loss. This perspective is strongly supported in the obesity literature, as two cognitive variables associated with weight loss maintenance –dichotomous thinking and disinhibition– have been shown to predict weight loss maintenance.

Dichotomous thinking. Dichotomous thinking is a cognitive distortion associated with cognitive rigidity and 'all-or-nothing' thinking. Thoughts are processed in an 'either/or' manner, rather than on a continuum (Beck, 1976; Byrne, Cooper, & Fairburn,

2004). Dichotomous thinking has been associated with negative emotions such as depression (Teasdale, Scott, Moore, Hayhurst, & Paykel, 2001), and dysregulated eating behaviours such as binge eating (Fairburn, Cooper, & Shafran, 2003). In a follow-up study assessing predictors of weight loss maintenance, weight regainers were found to endorse higher levels of dichotomous thinking than weight maintainers (Byrne et al., 2004). Specifically, global dichotomous thinking style, rather than food-related dichotomous thinking style, predicted weight regain. Thus, it is possible that weight regainers are more likely to view their weight loss as falling short of their goals, categorize their weight loss as a complete failure, and give up on any future effort to maintain their weight loss (Byrne et al., 2004). Weight regainers also demonstrated higher maximum lifetime weight levels that weight maintainers - a finding consistent with other research in the field (e.g., McGuire et al., 1999). This study suggests that future research should assess both dichotomous thinking and maximum lifetime weight in relation to weight loss maintenance.

Disinhibition. Disinhibition refers to periodic loss of control of eating (Wing & Phelan, 2005). Overeating associated with disinhibition occurs more frequently among restrained eaters than unrestrained eaters (e.g., Adams & Leary, 2007). Disinhibition is thought to have an "internal" factor, where an individual eats in response to internal feelings or thoughts (e.g., "When I feel lonely, I console myself by eating") and an "external" factor, where an individual eats in response to external social cues (e.g., "When I am with someone who is overeating, I usually overeat too"; Niemeier, Phelan, Fava, & Wing, 2007). It differs from impulsivity; a personality construct that reflects one's difficulties in waiting for a reward and/or a rapid response style (Reise, Moore,

Sabb, Brown, & London, 2013). Baseline internal disinhibition is associated with weight regain after weight loss (Bond, Phelan, Leahey, Hill, & Wing, 2009; McGuire et al,1999), and has been found to significantly predict weight change over time after controlling for depression, binge eating, and perceived stress (Niemeier et al., 2007). It is thought that among individuals with high internal disinhibition, the relationship between depression, stress and weight regain may be especially strong. Individuals with high internal disinhibition might engage in a cycle of eating in response to negative mood, resulting in poorer weight loss outcomes (Niemeier et al., 2007). The research suggests that this effect is exacerbated when depression is involved in the cyclical eating/negative mood cycle (McGuire et al., 1999; Wing & Phelan, 2005).

Emotional perspectives on weight-loss maintenance. When individuals experience negative emotions such as failure, shame, or loneliness, they may engage in eating or overeating behaviours (Kemp, Bui, & Grier, 2013; Masheb & Grilo, 2006). These eating behaviours may become a maladaptive coping strategy for managing distressing emotions. The literature suggests that relying on eating as a strategy to soothe feelings of distress may interfere with weight loss maintenance. In particular, two variables – emotional eating and binge eating – may lead to weight gain.

Emotional eating. Emotional eating refers to eating in response to emotions rather than hunger. Emotional eating is considered to be an affect regulation strategy, such that individuals use emotional eating as way to decrease their emotional distress (Lazarevich, Camacho, Velasquez-Alva, & Zepeda, 2016). Emotional eating is considered to be a learned behavior. It is thought that emotional eating is reinforced by a decrease in one's aversive mood state (Wong & Qian, 2016). Emotional eating often

leads to overeating and has been acknowledged as an important reason why weight loss diets fail (Konttinen et al., 2010; as cited in Kemp, Bui, & Grier, 2013).

Emotional eaters are found in both non-clinical and clinical populations. In non-clinical samples, individuals tend to eat in response to certain emotions. In clinical eating disorder samples, it is thought that individuals emotionally *over*eat, particularly when experiencing distressing emotions like anxiety and sadness (Masheb & Grilo, 2006). Emotional overeating has been related to disinhibition and obesity (Masheb & Grilo, 2006) and appears to be related difficulties maintaining weight loss.

Shame and emotional eating. Recently, shame has been specifically linked to emotional eating. In 2016, 250 female participants were involved a study assessing relationships between specific emotions and emotional eating (Wong & Qian, 2016). Participants reported their feelings of shame, anxiety, depression, and their degree of emotional eating. With anxiety and depression controlled for, shame remained a significant predictor of emotional eating. Next, researchers recruited 91 female university students who were attempting to lose weight. Participants were informed that the purpose of the study was to determine the effect of attempted weight loss on food preferences. Participants were randomly assigned to a group where they were induced with either anxiety (control) or anxiety-with-shame (experimental group). Their degree of emotional eating as measured by their binge impulsive, actual food intake, and pleasure in eating was assessed. Results demonstrated that participants in the anxiety-with-shame group reported a greater binge impulse than participants in the anxiety group; however, pleasure in eating and the actual food intake did not differ between groups (Wong & Qian, 2016). The authors suggest that actual food intake between groups did not differ due to the

artificial laboratory settings, and that outside of the laboratory participants may have been more willing to act on their binge urges. Findings indicate that shame and emotional eating demonstrate a strong relationship, and that shame may serve as a risk factor for engaging in increased eating behaviours.

Binge eating. Among obese individuals, it has been suggested that emotional eating may precipitate a binge eating episode (Arnow, Kenardy, & Agras, 1995). Binge eating refers to eating significantly more food in a short period of time than most other people would eat under similar circumstances (APA, 2013). Binge eating commonly occurs during weight loss efforts, interferes with weight loss goals (Heartherton & Baumestier, 1991), and has been shown to predict weight regain in community samples. For example, the National Weight Control Registry (NWCR; Klem, Wing, McGuire, Seagle, & Hill, 1997) is one of the largest community databases assessing factors that influence weight loss maintenance, and has been recruiting and tracking successful weight loss maintainers since 1994. In 1999, McGuire, Wing, Klem, Lang, & Hill investigated which specific factors predicted weight loss maintenance in a sample of successful weight loss maintainers (n = 714). The study reported that although 59% of the sample maintained their weight loss within 5 pounds, about 35% of the sample regained weight in the past year. Weight regain was predicted by higher levels of disinhibition, depression, and binge eating at baseline (McGuire et al., 1999).

If individuals engage in binge eating behaviour that is recurrent, associated with marked distress, and accompanied by a sense of loss of control, they may meet diagnostic criteria for Binge Eating Disorder (BED; APA, 2013). Individuals with BED engage in a repetitive, overconsumption of food in a short period of time while experiencing a sense

of loss of control, but do not engage in the compensatory behaviour seen in bulimia nervosa such as self-induced vomiting or fasting (APA, 2013). BED was first noticed in a subset of obese persons (Stunkard, 1959). In a population based study, 37% of obese women (BMI>30) were found to have BED (Bulik, Sullivan, & Kendler, 2002). Dichotomous thinking, disinhibition, and emotional eating patterns that interfere with weight loss maintenance are thought processes and behaviours commonly found among BED populations (e.g. Masheb & Grilo, 2006; Seamoore, Buckroyd, & Stott, 2006). Theoretical frameworks suggest that in childhood, individuals with BED may have been exposed to negative comments about weight, shape, and eating (Fairburn et al., 1998). As adults, they may experience stressful, negative, and intense feelings concerning their body weight and shape (APA, 2013; NIH, 2004). Shame is thought to drive and maintain dysregulated eating patterns among BED sufferers (APA, 2013).

Two influential models have proposed how binge eating relates to emotions and emotional eating. The first model, Restraint Theory, proposes that individuals who restrain their dietary intake (e.g., as seen in anorexia) show disinhibition of restraint after eating an amount of food that does not follow their restrictive diet (Polivy & Herman, 1975). Related research builds on this theory and suggests that binge eating also tends to occurs while experiencing negative affect (e.g., Pearson, Riley, Davis, & Smith, 2014). While the literature has supported these findings, recent research suggests that only restrained eaters who are prone to emotional eating tend to overeat after experiencing negative affect (Ouwens, van Strien, & van der Staak, 2003). This suggests that restrained dieters who are prone to emotional eating may be at an increased risk for

overeating and potential weight gain (Ouwens et al., 2003). The second model is Heartherton & Baumeister's (1991) Escape Model of Binge Eating. This model suggests that binge eaters have unflattering views of themselves and demonstrate high levels of aversive self-awareness. Their distress with their body shape and size is thought to result from self-comparisons to societal norms and/or expectations, as well as from weight stigmatization (Heartherton & Baumeister, 1991). In order to escape from their distress, binge eaters refocus their awareness on present emotions and sensations (such as those that accompany a binge eating episode), rather than thinking in terms of long-term goals and values. According to this model, binge eaters have unflattering views of themselves, experience distressing emotions, and binge eat to escape from these distressing feelings (Heatherton & Baumeister, 1991).

Binge eating as an escape from weight-based stigma. Although the Escape Model of Binge Eating has been primarily elaborated on within clinical populations, it has provided an assay into understanding relationships been weight stigmatization and obesity within community populations. In 2007, a large national not-for-profit study assessed relationships between internalization of weight-based stereotypes, indices of emotional well-being, and eating behaviours such as binge eating (Puhl, Moss-Racusin, & Schwartz, 2007). One thousand and thirteen female participants whose BMI fell within the overweight or obese range completed an online battery of self-report questionnaires pertaining to the key variables in question. Participants were also asked to identify weight-based stereotypes commonly attributed to obese persons (e.g., lazy, unintelligent, poor hygiene, jolly) and report the degree they believed the stereotypes to be true. Results showed that 66 % of responders believed the stereotypes to be untrue, 33%

believe them to be sometimes true, and 7% believed them to be true. There were no differences across BMI categories in degree of internalization of stereotypes. However, individuals who believed the stereotypes to be true were more likely to cope with stigma by refusing to diet, and reported more binges per week. The researchers suggested that the internalization of weight-based stereotypes may reduce motivation for weight loss, triggering increased binge eating behaviours. Furthermore, individuals who feel discouraged and unmotivated may 'eat more' as a temporary escape from self-awareness (Puhl et al., 2007). Binge eating as a response to weight stigmatization appears to be one way that some individuals manage distress associated with this experience.

The proposal that binge eating may serve to mitigate psychological distress associated with weight-based stigmatization was further examined within a treatment-seeking obese population. Ninety-three adults completed questionnaires relating to the key variables in question. Results showed that weight-based stigmatizing experiences predicted binge eating behaviour and psychological distress ($R(2)=.20$, $p<.001$; $R(2)=.18$, $p<.001$, respectively). However, psychological distress accounted for a substantial amount of variance in explaining the relationship between weight-based stigma and binge eating (i.e., 20%). When psychological distress variables were controlled for, the association between stigmatizing experiences and binge eating behaviours was significantly reduced. Researchers suggest that the weight-based stigmatization may trigger psychological distress which, subsequently, may lead to binge eating behaviour that serves to reduce the distress (Ashmore et al.2008).

To explain relationships between shame and binge eating in eating disordered populations (i.e., bulimia nervosa), Goss and Gilbert (2002) proposed a 'shame-shame'

cycle. In their model, they suggest that individuals who engage in binge eating behaviours experience high levels of shame. To decrease their feelings of shame, some individuals engage in compensatory behaviours, such as purging. However, the compensatory behaviour may trigger distressing emotions. For example, an individual who engaged in purging may experience heightened self-disgust associated with the secrecy of the purging behaviour. To manage these distressing emotions, individuals re-engage in binge eating behaviours; ultimately propagating the shame-shame cycle (Goss & Gilbert, 2002).

In applying Goss and Gilbert's (2002) model to obesity, it may be that some obese persons who experience high levels of shame (i.e., due to weight-based stigmatization) may engage in compensatory behaviours, such as emotional eating, to mitigate their emotional distress. However, engaging in emotional eating and straying from a diet plan may trigger distressing emotions, such as shame. To manage these distressing emotions, individuals may re-engage in emotional eating behaviours; ultimately propagating the shame-shame cycle.

Summary of behavioural, biological, cognitive, and emotional perspectives.

Behavioural, biological, cognitive, and emotional perspectives on weight loss maintenance suggest that individuals who maintain weight loss engage in similar behaviours. These behaviours include engaging in frequent physical activity, consuming a reduced-calorie diet, and frequently self-monitoring weight. However, it is unclear why some individuals are able to maintain these behaviours over time while others are not. Biological perspectives point to individual differences in the genetic or physiological propensity for weight gain. Yet, there is still a lot of unexplained variance in determining

weight loss maintenance (e.g. not all obese individuals demonstrate symptoms of food addiction).

Cognitive perspectives on weight loss maintenance suggest that certain cognitive variables – dichotomous thinking and disinhibition – influence the ability to maintain weight loss. Dichotomous thinking and disinhibition are associated with negative emotions including depression and anxiety; emotions that have been related to emotional overeating. Emotional perspectives on weight loss maintenance suggest that some individuals may find it difficult to cope with negative emotions, such as shame, and thus engage in emotional (over)eating behaviours to cope with their distress. These eating behaviours may be maladaptive in the long run as they may reduce one's ability to adhere to behaviours associated with weight loss maintenance (e.g., sticking with a diet plan). Among individuals who are obese, maladaptive eating behaviours (such as binge eating) may also function as a way to escape from psychological distress associated with weight-based stigma.

Across clinical and community samples, it appears that higher levels of depression, binge eating, and higher maximum lifetime weight are predictive of eventual weight regain. Individuals in community samples who struggle with weight loss maintenance endorse characteristics common to clinical eating disordered samples (i.e., elevated levels of emotional eating), and struggle with similar maladaptive behaviours (i.e., binge eating). Within clinical binge eating disordered populations, shame drives and maintains dysregulated eating patterns; suggesting that some individuals with obesity may also experience heightened levels of shame that interfere with their weight loss goals (APA, 2013). Taken together, the literature suggests that shame may be an important

variable to consider in delineating relationships between obesity and weight loss maintenance.

Shame

Shame is a painful emotion focused on one's sense of self. It arises from thinking one is flawed or defective, and/or thinking that others also view you in that way (Gilbert, 2011). It is strongly related to negative affect and associated emotions including anxiety, anger, humiliation, and disgust (Gilbert, 1998). Shame has been related to depressive symptoms, low self-esteem and low self-confidence, social dysfunction, emotional eating, cognitive restraint and disinhibition (Allan, Gilbert, & Goss, 1994; Andrews, Qian, & Valentine, 2002; Kaufman, 1989; Macht, Gerer, & Ellgring, 2003; Pila, Sabiston, Brunet, Castonguay, & Loughlin, 2016; Raspopow, Abizaid, Matheson, & Anisman, 2010), and has been found to be consistently higher among clinical populations (e.g., Doran & Lewis, 2011). Some individuals may be more prone to shame than others due factors including genetic dimensions, interpersonal relationship difficulties, or traumatic experiences (Gilbert, 1998).

Although shame theories have been rooted in different schools of thought (e.g., psychoanalytic; Lewis, 1971), the majority of shame theorists fall within the cognitive-affect category (Gilbert, 1998). Cognitive-affect theorists understand shame as associated with particular types of appraisals that are unwanted, involuntary, and difficult to control (Gilbert, 1998). Shame appraisals typically relate to self-evaluations of being inferior to others (Gilbert, 1998). Self-blame, self-consciousness, negative social comparison, and failing to meet standards are thought to be common correlates of shame (Gilbert, 1998). As described by Gilbert (1998):

> Shame is an inner experience of the self as an unattractive social agent, under pressure to limit possible damage to the self via escape or appeasement…It does not matter if one is rendered unattractive by one's own or other people's actions; what matters is the sense of personal unattractiveness – being in the social world as an undesired self, a self one
>
> does not wish to be. Shame is an involuntary response to an awareness that one has lost status and is devalued. (p. 22)

It has been suggested that shame differs from the other self-conscious emotions (i.e., guilt) in several ways. Unlike in shame, where the focus is on the total self as a failure, guilt occurs when individuals evaluate their behaviours or actions in the real world as failures (Lewis, 1971; Lewis, 2011). In guilt, an individual may engage in corrective action to repair the failure; ridding themselves of their distress (Lewis, 2011). Thus, guilt is thought to be experienced as less intensely negative compared to shame (Lewis, 2011).

The content of shame typically focuses on two main components (Gilbert & Procter, 2006). The first, external shame, refers to thinking or feeling that others view the self negatively and/or the self is seen as having characteristics that are unattractive and thus rejectable or vulnerable to attacks from others (Gilbert & Procter, 2006). Attention is focused on how others view the self. The second component, internal shame, refers to self-directed feelings and evaluations of the self in a self-critical and negative light (e.g., the self is inadequate, flawed, or bad). Attention is focused on the self (Gilbert & Procter, 2006). External and internal shame may be experienced independently or simultaneously (Gilbert & Procter, 2006).

Shame has been conceptualized as being a state or trait phenomenon (Tantum, 1998). State shame, or the experience of feeling ashamed, is transient. As such, it may not be related to any particularly psychopathology (Tantum, 1998). In fact, state shame may serve an adaptive purpose (e.g., provide an individual with evidence of their social wrong-doing). Conversely, trait shame is thought to be detrimental for emotional health. It arises due to a constant awareness of a 'fault' of which the person is ashamed, or through shaming actions of others. It is trait shame that has been related to emotional disorders (Tantum, 1998). Being prone to shame (e.g., being ashamed of one's body or some aspect of the self) may itself become a trigger for future increased shame (Tantum, 1998).

From a phenomenological perspective, shame is feeling seen in a painfully diminished sense where the inner self is exposed to view (Kaufman, 1989). Feelings of shame may be experienced in a general manner and refer to feelings of negative affect involving social or moral transgressions (e.g., Tangney, Wagner, & Gramzow, 1989). Experiencing shame is related to feelings of wanting to run away, hide, or disappear (Lewis, 1971; Lewis, 2011). To avoid shame, individuals may withdraw from shame-provoking situations; for example, an individual who is obese may avoid going to the gym in fear of experiencing stigmatizing experiences from other patrons.

Shame may be experienced in a general manner and refer to feelings of negative affect involving social or moral transgressions (Tangney et al., 1989). Shame may also be experienced in a more specific manner and refer to shame pertaining to character, behaviour, or body (Andrews et al., 2002). The literature suggests that bodily shame may be particularly related to disordered eating patterns such as anorexia nervosa within

clinical samples (e.g., Troop & Redshaw, 2012). However, bodily shame's specific association with disordered eating patterns (such as emotional eating) within community populations is unclear.

Shame and obesity. The literature suggests that individuals who are obese may be particularly prone to experiencing shame. This may be due to the manner in which individuals with obesity understand their condition. Qualitative interviews with individuals living with obesity have suggested that the shame may pertain to self-blame regarding poor weight management. Participants have reported feelings of shame and embarrassment with their inability to control their weight on their own. Although participants addressed cultural, social, and organizational barriers to weight loss, they placed the final explanation for their weight status on themselves and expressed immense feelings of guilt and shame when behavioural weight loss strategies failed (Kirk, Price, Penney, Rehman, Lyons, Piccinini-Vallis, &...Aston (2014). It can be inferred from this study that individuals who engage in greater self-blame may be internalizing weight-based stereotypes to explain their difficulties with weight loss management (e.g. "I am too lazy"); which may in turn contribute to their failed weight loss strategies. It further suggests that some individuals may be unaware of biological and physiological aspects that may be interfering with their weight loss.

Individuals with obesity may also be prone to experiencing increased shame due to individual differences in biopsychological processes. Recent research suggests that food can change one's emotional state through psychological processes. In a study assessing the effects of food energy on the emotional state of normal weight and overweight women, researchers found that both normal weight and overweight women

experienced greater shame, sadness, fear, and sleepiness after eating high-energy food. However, this effect was more pronounced among overweight women than normal weight women. Overweight women also showed higher levels of cognitive restraint and disinhibition compared to normal weight individuals. Furthermore, main effects on shame were shown for disinhibition (F (1,36) = 5.4, $p < .05$) and hunger, (F (1,36) = 6.2, $p < .05$; Macht et al., 2003). Taken together, results suggest that overweight women tend to experience higher levels of disinhibition resulting in feelings of shame; shame that may be experienced to a greater extent than among normal weight women (Macht et al., 2003). It is possible that this finding is maintained or even exacerbated among obese women.

Shame, obesity, and weight-based stigma. Perhaps most saliently, weight-based stigma directed at obese populations appears to play a crucial role in garnering feelings of shame. A recent six month longitudinal study assessed relationships between coping, shame, guilt, weight loss, and stigmatizing experiences among 98 obese German individuals. Shame associated with obesity was assessed through the use of the 'Weight and Body Related Shame and Guilt Scale' (WEB-SG: Conradt, Dierk, Schlumberger, Rauh, Hebebrand, & Rief, 2007). Results showed that weight stigmatization at baseline significantly predicted feelings of body shame six months later (Conradt et al., 2008). However, body shame was found to be unrelated to BMI (Conradt et al., 2008). These findings suggest that weight stigmatization might play a key role in promoting shame and body image distress among obese persons. In context with other research findings, this research suggests that the manner in which some obese individuals experience and/or

internalize weight based stigma might specifically account for their feelings of bodily shame, regardless of their actual size or shape.

Weight stigmatization in the form of social exclusion may be a particularly powerful trigger for shame among individuals with obesity. In a novel online game paradigm, 130 individuals with normal weight (i.e., BMI 18.5 – 24.9) and 169 individuals with obesity (i.e., BMI ≥ 30) were randomly assigned to a social exclusion condition or control condition. Social exclusion was found to significantly increase negative emotions (i.e., shame, anger, and sadness) in both groups compared to the control condition. Among individuals with normal weight, social exclusion had no specific effects on feelings of shame, anger, or sadness. Among individuals with obesity, social exclusion had no specific effects on sadness or anger; however, it resulted in a specific increase of shame ($p < .001$, Cohen's $d = .07$). These results suggest that individuals with obesity specifically respond with shame when experiencing stigmatizing experiences, such as social exclusion (Westermann, Rief, Euteneuer, & Kohlmann, 2015). As social rejection may occur as part of weight-based stigmatization, individuals with obesity may be particularly primed for experiencing heightened feelings of shame in social situations.

Shame and affect regulation. In 2005, Gilbert proposed an influential biopsychosocial model of affect regulation that explains mechanisms underlying shame. The model proposes that one's affect (overall combination of one's emotions, attitudes, and moods) is regulated by three affect-regulatory systems shaped by evolution: the 'threat', 'soothing', and 'drive' systems (Gilbert, 2005; Gilbert, 2010). These systems are responsive to both external stimuli (e.g., social interactions) and internal stimuli (e.g.,

self-talk). The threat system is stimulated by negative stimuli, such as self-criticism, yielding feelings including anger, anxiety, guilt, and shame. The soothing system is stimulated by positive stimuli such as warmth, kindness, and compassion, yielding feelings of safeness and calmness (Gilbert, 2005; Gilbert, 2009; Gilbert, 2010). The soothing system evolved to regulate the effects of the threat system. Under normal circumstances, when the threat system is stimulated, the soothing system is also stimulated and works to counterbalance the effects of the threat system by promoting feelings such as self-compassion (Gilbert, 2005; Gilbert & Irons, 2005).

For individuals with high shame and self-criticism, their soothing system is poorly accessible. Their threat system dominates their understanding of their personal and worldly experiences. It is thought that these individuals have not developed an adequate soothing system to counterbalance the effects of the threat system. This may result in some individuals engaging in 'safety behaviours' that serve to protect them from (interpersonal) threat. These safety behaviours may include submissive safety behaviours that predispose them to be aware of the rank, status, and power of other in relation to themselves, to perceive themselves as inferior, to being quick to feel socially anxious and uncertain, to engage in appeasing behaviours, and to demonstrate avoidance in the face of interpersonal conflict (Gilbert, 2009). These behaviours have been related to psychopathology including anxiety and depression, lower self-esteem, and interference in life goals (Gilbert, 2009).

Drawing from social rank theory, Gilbert's model proposes that perception of social status influences emotions, mood, and behaviours (Gilbert, 1989; Gilbert, 1992). Individuals who perceive their social status to be lower than others feel more inferior to

others and looked down upon (Gilbert, 2000). These individuals tend to engage in submissive behaviour as a defensive strategy to avoid receiving unwanted attention, and possible harm, from more dominant others (Gilbert, 2000). The submissive strategies include trying to escape or hide, or adopting submissive displays and behaviours to limit possible attacks (Gilbert, 2000). Shame (and possibly accompanying social anxiety and depression) is related to engaging in defensive submissive strategies as a result of being placed in a low status/rank position (Gilbert, 2000).

The threat system may become especially complex when interacting with the drive system. Some individuals are driven to avoid negative events and think in terms of words like 'should', 'ought', and 'must' in pursuing goals. Individuals who are especially driven by the drive system may pursue status (e.g., material possessions, achievements, or being liked) to feel safe and avoid feelings of rejection or inferiority. If they fail, they may become increasingly self-critical.

In extending Gilbert's biopsychosocial model of affect regulation and Goss and Gilbert's (2002) clinical model to obesity, individuals who are obese are part of a minority group who experience frequent weight stigmatization and social shaming. They may perceive their social status to be lower than normal weight individuals. They may feel inferior to normal weight others and experience high levels of shame. Some individuals who are obese may cope with their feelings of shame by engaging in emotional eating behaviour. Some individuals may experience heightened shame after engaging in these strategies, especially if this behaviour is not in line with their drive system (e.g., they believe they 'should not' have done this behaviour). In order to mitigate feelings of shame, some individuals may re-engage in emotional eating and

become stuck in a shame-shame cycle. It is possible that emotional eating is the underlying mechanism between shame and weight regain, such that shame leads to emotional eating which, in turn, promotes weight regain. This further suggests that obese individualswho present with high levels of shame and high levels of emotional eating may be particularly vulnerable towards experiencing weight regain over time, as compared to individuals who present with high levels of shame but low levels of emotional eating (i.e., they do not rely on emotional eating to cope with distress).

Shame and Compassion-Focused Therapy (CFT). To target the maladaptive cognitive and behavioural outcomes of shame and self-criticism, Gilbert developed compassion-focused therapy (CFT). CFT arose out of observations that people with high shame and self-criticism typically have great difficulties in being kind or compassionate to themselves or others (Gilbert, 2010). The goal of CFT is for clients to understand the function of their safety behaviours, so they can understand that their pathology and symptoms are ‘not their fault’ but have emerged as safety strategies needed for everyday functioning (Gilbert, 2010). In CFT, individuals learn how to stop criticizing and blaming themselves for their thoughts, feelings, or behaviours, in order to take responsibility for them and cope with them in a more adaptive manner (Gilbert, 2010). The premise of CFT is that treating oneself kindly and compassionately may counteract feelings of guilt and shame. Thus, self-compassion is thought to be the antidote to shame (Gilbert, 2010).

Self-Compassion

Self-compassion refers to being open and moved by one’s own suffering, an attitude of caring and kindness toward oneself, taking an understanding, nonjudgmental

approach toward one's inadequacies and failures, and seeing one's own experiences as part of the common human experience (Neff, 2003). Self-compassion is thought to consist of three main components that influence and interact with one another: kindness and understanding to oneself, a sense of common humanity, and being aware and mindful of one's thoughts (Neff, 2003). Self-compassion is thought to be especially important when faced with personal mistakes, failures, and situations outside of our control (Germer & Neff, 2013).

Occasionally, self-compassion is confused with related constructs including self-esteem, self-pity, and self-indulgence. Self-esteem represents an evaluation of one's worth compared to others. Conversely, self-compassion is not based on a discriminatory or evaluative judgement; rather, it is a way to relate to oneself (Neff, 2012). Self-pity refers to a sympathetic, heartfelt sorrow for oneself prompted by one's own suffering, distress, or unhappiness (Strober, 2003). Individuals who experience self-pity are inwardly focused on their own distress and ignore their interconnectedness with others. They may experience heightened feelings of separation from others and exaggerated personal distress. This differs from self-compassion, where individuals view their own experiences in relation to others. That is, their distress is acknowledged but not disconnected from humanity; ultimately allowing them to put their situation into greater perspective (Neff, 2012). Finally, some individuals believe that being compassionate or kind to oneself is self-indulgent. They believe that self-compassion impedes with accomplishing goals, and that self-criticism is a more effective motivator for goal success. Self-criticism is used as a way to shame oneself into action when confronting personal weaknesses (Neff, 2012). This suggests that if the personal weakness cannot be

remedied through the shaming process, individuals may experience increased distress and feelings of shame may be exacerbated.

Self-compassion and mental health. Over 200 articles have assessed the impact of self-compassion on numerous psychological variables (Germer & Neff, 2013). Across the studies, self-compassion demonstrates a positive relationship with psychological health (Germer & Neff, 2013) and decreased psychopathology (Barnard & Curry, 2011). Specifically, it has been negatively related to depression, anxiety, suppression, and rumination (e.g., Neff, 2003), and positively associated with behavioural changes such as reducing smoking behaviours (Kelly, Zuroff, Foa, & Gilbert, 2009) and starting a fitness regiment (Magnus, Kowalski, & McHugh, 2010).

Shame, self-compassion, and eating behaviours. Gilbert's model proposing that shame can be targeted by increasing self-compassion has begun to garner empirical support when used with individuals exhibiting thoughts and behaviours common in eating disordered populations. Inducing self-compassion among highly restrictive eaters was found to decrease disinhibition, or overeating after eating an unhealthy preload of food, in college women (Adams & Leary, 2007). Lower self-compassion has been positively related to higher external shame and body image dissatisfaction, and negatively related with depression and anxiety symptoms (Ferreira, Pinto-Gouveia, & Duarte, 2013). In a recent study, 215 undergraduate students completed self-report questionnaires assessing self-compassion, emotional intolerance (i.e., in this study, defined as the inability to tolerate negative emotions like depression or anxiety), and attitudes indicative of binge eating severity (Webb & Forman, 2013). Their BMI was also calculated. Results showed that self-compassion was negatively associated with binge

eating severity. This relationship was mediated by emotional tolerance and unconditional self-acceptance. The researchers suggest that integrating self-compassion training into college health promotion efforts may mitigate appreciable levels of binge eating behaviour in this population (Webb & Forman, 2013).

Within clinical populations, the research suggests that self-compassion may be effective for shame reduction and decreasing eating disorder symptomatology. In a longitudinal study by Kelly, Carter, & Borairi (2014), 97 participants enrolled in either a specialized day treatment program or inpatient hospital had their degrees of self-compassion, shame, and eating disorder symptoms measured over 12 weeks of treatment. Multilevel modeling indicated that larger increases in self-compassion early in treatment resulted in faster decreases of shame and eating disorder symptomatology over 12 weeks. Furthermore, participants who had faster decreases of shame in the first four weeks of treatment had faster decreases in their eating disorder symptoms over the 12 weeks of treatment. The authours suggest that targeting shame and self-compassion early in treatment may have important implications for improved eating disorder treatment outcomes (Kelly et al., 2014).

Recently, compassion-focused therapy has begun to be successfully integrated into eating disorder treatment programs. In 2014, Gale, Gilbert, Read, & Goss (2014) integrated CFT into a standard cognitive-behavioural treatment program for people diagnosed with eating disorders. One hundred and thirty-nine individuals took part in the study and completed measures pertaining to their eating disordered symptomatology and psychological distress. The researchers also conducted a program evaluation assessing clinically significant change among participants. Results showed that participants

significantly improved on all assessment measures and associated subscales. Interestingly, the program was shown to be particularly effective for participants who were diagnosed with bulimia nervosa (as compared to anorexia nervosa or eating disorders not otherwise specified), with 73% considered to be 'recovered' at the end of treatment and 4% 'improved'. Researchers suggest that this may be due to a stronger 'critical voice' endorsed by some individuals with anorexia nervosa that is particularly challenging to target in therapy (Gale et al., 2014). Findings from this study suggest that compassion-focused interventions may be particularly helpful for individuals within the community who also engage in bulimia-related behaviours, such as binge eating.

In comparing clinical and community populations, recent research suggests that targeting self-compassion in non-clinical populations may be particularly important for decreasing or preventing eating disorder symptoms. Kelly, Vimalakanthan, & Carter (2014) assessed the roles of self-esteem, self-compassion, and fear of self-compassion (i.e., restraint towards treating oneself compassionately) in eating disorder pathology for females in non-clinical (undergraduate students, $N = 155$) and clinical (eating disorder patients, $N = 97$) populations. Results revealed that, when controlling for self-esteem, low self-compassion was the strongest predictor of eating disorder pathology in the student group, whereas high fear of self-compassion was the strongest predictor of eating disorder pathology in the patient group. Researchers suggest that building self-compassion may be important for eating disorder prevention, while targeting fear of self-compassion may be important for clinical intervention purposes (Kelly et al., 2014). This suggests that for individuals who struggle with obesity, interventions related to building

self-compassion during their weight loss journey may be particularly helpful for weight loss.

The Current Study: Purpose and Hypotheses

Individuals who are obese form a heterogeneous group. To date, psychological variables that have been associated with difficulties with weight loss maintenance in obesity include body image distress, weight stigmatization, emotional eating due to disinhibition and dichotomous thinking, and binge eating. These variables have been positively associated with shame; however, shame has yet to be specifically studied in relation to weight loss maintenance. Shame may represent an impediment for weight loss maintenance if shame interferes with one's ability to maintain behavioural patterns necessary for weight loss maintenance. Specifically, individuals with higher degrees of shame may be more prone to engage in emotional eating behaviours; increasing their likelihood of eventual weight gain. One study has found a positive association between shame and eating disorder symptoms (Kelly et al., 2013), but the relationship between shame and emotional eating on weight loss outcome has yet to be studied in obese populations.

Self-compassion has garnered empirical support as an important variable for promoting adherence to behavioural change plans. Within the eating disorders literature, individuals higher in self-compassion have demonstrated lower degrees of shame and less maladaptive eating behaviours (e.g., binge eating). In the community, individuals higher in self-compassion and lower in shame may be less likely to engage in potentially maladaptive eating behaviours (e.g., emotional eating) and more likely to engage in adaptive weight loss maintenance behaviours (e.g., sticking to a diet plan). Perhaps 'high

shame' subgroups in obese populations may benefit from self-compassion interventions that have been found to be effective in clinical eating disordered populations.

The purpose of this study is to investigate the roles of shame and self-compassion in predicting weight loss maintenance and weight regain in a community sample of obese individuals who recently lost at least 5% of their body weight. Translating and disseminating specific predictors of weight loss maintenance and weight regain has the potential to lead to innovative interventions for weight loss programs. Furthermore, it can decrease emotional distress and foster hope for obese persons who struggle with the physical and emotional consequences of obesity.

There are four main hypotheses for this study. First, it is predicted that shame and self-compassion will demonstrate a negative relationship over time. This would be consistent with Gilbert's biopsychosocial model of affect regulation and the compassion-focused therapy model. Second, baseline shame will be positively related to weight regain over time. Third, baseline self-compassion will be positively related to weight loss maintenance over time. Finally, emotional eating is hypothesized to play a role in explaining or influencing the relationship between shame and weight regain. It is predicted that emotional eating may mediate the relationship between shame and weight regain, as shame may lead to emotional eating which, in turn, may lead to weight regain. It is also predicted that emotional eating may moderate the relationship between shame and weight regain, such that individuals with higher shame and who engage in greater emotional eating may be more likely to regain weight over time as compared to individuals who do not rely on emotional eating behaviours to cope with feelings of shame.

Method

Study Design

A mixed-methods longitudinal prospective cohort design was used to assess relationships between shame, self-compassion, and body weight over time. Individuals whose body mass index (BMI) fell within the obese range (i.e. BMI ≥ 30) and who intentionally lost at least 5% of their body weight through diet and exercise in the past four weeks were invited to take part in this study. At baseline, participants took part in biological and psychological assessments. During the biological assessment, participants had their body composition measured which included measuring their height and weight. During the psychological assessment, participants completed questionnaires relating to demographic information including age, gender, education, occupation, and marital status. Participants' weight and weight history were assessed via self-report. Finally, participants completed several self-report measures assessing shame, self-compassion, depression, anxiety, and emotional eating. Two similar follow-up assessments were conducted at six and twelve month follow-up. In addition, participants were also asked to self-report their weight and complete a measure assessing emotional eating at three month follow-up.

Participant Recruitment

Participants were adults (male and female) between the ages of 19-60 who were obese and had recently achieved a weight loss of at least 5% of their body weight. Using Cohen's Power Primer (Cohen, 1992), an a priori power analysis for multiple regression with an alpha set at .05 was conducted. A total sample size of $N = 67$ was found to be needed in order to achieve a medium effect, and a total sample size of $N = 30$ was needed

for a large effect. Thus, for optimal power, it was determined that the desired sample should have a minimum of 70 participants.

Selection methods. Participants were recruited from the community by poster advertisements, pamphlets, and online social media forums (see Appendix X). Posters were posted at Memorial University, the College of the North Atlantic, various hospitals in St. John's, local fitness centers, and physicians' offices. Pamphlets were placed in the kit bags of runners participating in the Tely 10, an annual running race located in St. John's. On social media forums, a short description of the study was posted on various business pages on Facebook (e.g. FitBody Bootcamp). The study was also advertised on Kijiji, as well as on a local radio station's (VOCM) webpage. The study advertisements stated that the study was recruiting individuals who had recently lost weight. Potential participants were instructed to go to the study website or contact the phone number listed on the poster.

Recruitment process. Potential participants completed an online interview screening and/or participated in a phone interview screening. The online screening was conducted using a program called Fluid Survey. On Fluid Survey, participants completed a short questionnaire that assessed their eligibility for the study according to the inclusion and exclusion criteria (see Table 1 for criteria). The screening survey asked participants specific questions about their age, height, current weight, and weight before and after weight loss. This allowed calculation of their BMI before their most recent weight loss episode and ensured they had lost at least 5% of their body weight within the past four weeks. The minimum requirement of 5% weight loss is consistent with previous research showing improved health associated with weight loss of this magnitude. There was no

weight specifier for the study; however, it was necessary that participants met criteria for obesity (BMI ≥ 30) prior to their most recent weight lost. Participants were asked if they had received any medical weight loss treatment such as diet pills, bariatric surgery, or liposuction. They were asked if they had been diagnosed with an eating disorder or if they were diagnosed with any serious medical conditions that might explain their recent weight loss. Additionally, participants were asked if they engaged in substance use. Active substance use was thought to be a confounding variable for this study, as it has been shown to trigger overeating behaviours. Those who participated in the phone interview were asked the same questions. If the participant met all inclusion/exclusion criteria and was eligible to take part in the study, he/she was contacted by the researcher by email and/or by phone to schedule a baseline assessment appointment. If the participant did not meet the inclusion/exclusion criteria, the participant was contacted by email and was politely informed that he/she were not eligible for the study and thanked for his/her interest.

Table 1

Inclusion and exclusion criteria for participating in study

Inclusion	Exclusion
• Age 19-60 • BMI ≥ 30 prior to current weight loss episode • Weight loss ≥ 5% reached within the past four weeks	• Weight loss achieved through non-behavioural methods including bariatric surgery, prescription diet pills, or liposuction • Purging behaviours (i.e., self-induced vomiting or laxative misuse) within the past six months • Pregnancy

- Active substance abuse

In total, six hundred and sixty individuals completed the screening survey. Of these, 500 were deemed ineligible to take part (see Table 2 for a breakdown of the reason why these individuals were excluded).

Table 2

Breakdown of participant exclusion

N = 500	**Reason for exclusion**
288	Weight loss >1 month
78*	Weight loss < 5%
40	Initial BMI < 30
21	Weight loss > 1 month, Initial BMI < 30
13	Weight loss > 1 month, Weight loss < 5%
9	Medical condition affecting weight
7	Weight loss < 5%, Unintentional weight loss
6	Age > 60
6	Unintentional weight loss
6	Incomplete screening survey
4	Initial BMI < 30 AND Weight loss < 5%
4	Weight loss > 1 month, Unintentional weight loss
4	Weight loss > 1 month, Weight loss < 5%, Unintentional weight loss
4	Accidental exclusion
1	Weight loss > 1 month, Substance use disorder

1	Weight loss > 1 month, Incomplete screening survey
1	Unintentional weight loss, Incomplete screening survey
1	Age < 19
1	Weight loss > 1 month, Age > 60
1	Weight loss < 5%, Incomplete screening survey
1	Weight loss < 5%, Weight loss > 1 month, BMI < 30
1	Engaged in non-behavioural weight loss methods
1	Current Eating disorder
1	Current Substance use disorder

Note. BMI = Body Mass Index.

*3 of these participants were eligible to participate in the study at a later date.

One hundred and sixty people eligible to participate in the study. When contacted, seventy-nine people did not respond to the researcher's email or phone messages inviting them to take part in the study. Eighty-one participants consented to take part in the study. At the data screening stage, data from ten participants was removed from data analysis. Reasons for data removal were as follows: four participants did not meet the initial weight loss criteria; two participants did not complete the initial study questionnaires, two participants did not meet requirements during linearity testing, one participant withdrew from the study during baseline data collection; and one participant became pregnant prior to her second assessment. Thus, seventy-one participants were included in the final sample.

Data Collection Procedure

This study was part of a larger study that examined biological and psychological predictors of weight regain in obesity, including the assessment of weight-related hormones and body composition. Data collection took place in the Complex Diseases Laboratory, part of the Craig L. Dobbin Genetics Research Centre, at the Health Sciences Centre in St. John's, NL. In the larger study, the baseline, six month, and twelve month follow-up assessments consisted of both biological and psychological portions. The three month assessment consisted of a psychological portion. In order to increase participant retention, participants were emailed at three months and nine months reminding them of their subsequent appointments and asking them to confirm the upcoming appointments. As an incentive for participating in the study, participants were informed that if they completed all of their follow-up appointments, their names would be entered in a draw for a $100.00 gift certificate to a local mall.

Informed consent. Participants who met criteria to participate in the study were invited to come to the Health Science Center for their baseline assessment. Participants were provided with a consent form that explained the purpose and nature of the study, the anticipated risks and benefits, the procedures involved, and that the study involved two follow up assessments at six and twelve months (see Appendix A). A verbal overview of the study was also provided by the researcher. Participants were informed that the researcher would be contacting them via email in three months, at which time participants would be asked to complete a short online survey. The participant was given as much time as needed to read the consent form and ask questions about the study.

Once the participant chose to sign the informed consent form, the data collection process began.

Baseline assessment. The duration of the baseline assessment was approximately two hours. First, participants completed the biological portion of the study. Their blood was drawn by a registered nurse and they received a dual energy x-ray absorptiometry (DEXA) scan. The DEXA scan involved a low dose of a special type of x-ray that measures fat distribution, bone density, and body fat percentage. Participants' height and weight were measured using a physician-grade electric scale. At this point, participants were offered a short break to have a snack since they had to fast for 12 hours prior to the blood draw.

Next, participants completed the psychological portion of the study. This involved completing several self-report questionnaires pertaining to demographic and weight history information, depressive symptoms, shame, self-compassion, eating disorder symptoms, and emotional eating, (see Appendices B-G, respectively). Participants completed these questionnaires either in the lab or at home prior to their appointment. Participants were also asked to report whether they intended to keep losing weight or maintain their current weight loss. All of the data collected was recorded electronically in Fluid Survey to allow for easier input into the statistical software that was used for analysis. Finally, the researcher scheduled the follow-up appointments, and thanked the participant for their time. All subsequent assessments took place at the Health Sciences Centre.

Individuals who met criteria for participating in the study but were unable to come to the Health Sciences centre for an assessment due to logistical concerns (e.g.,

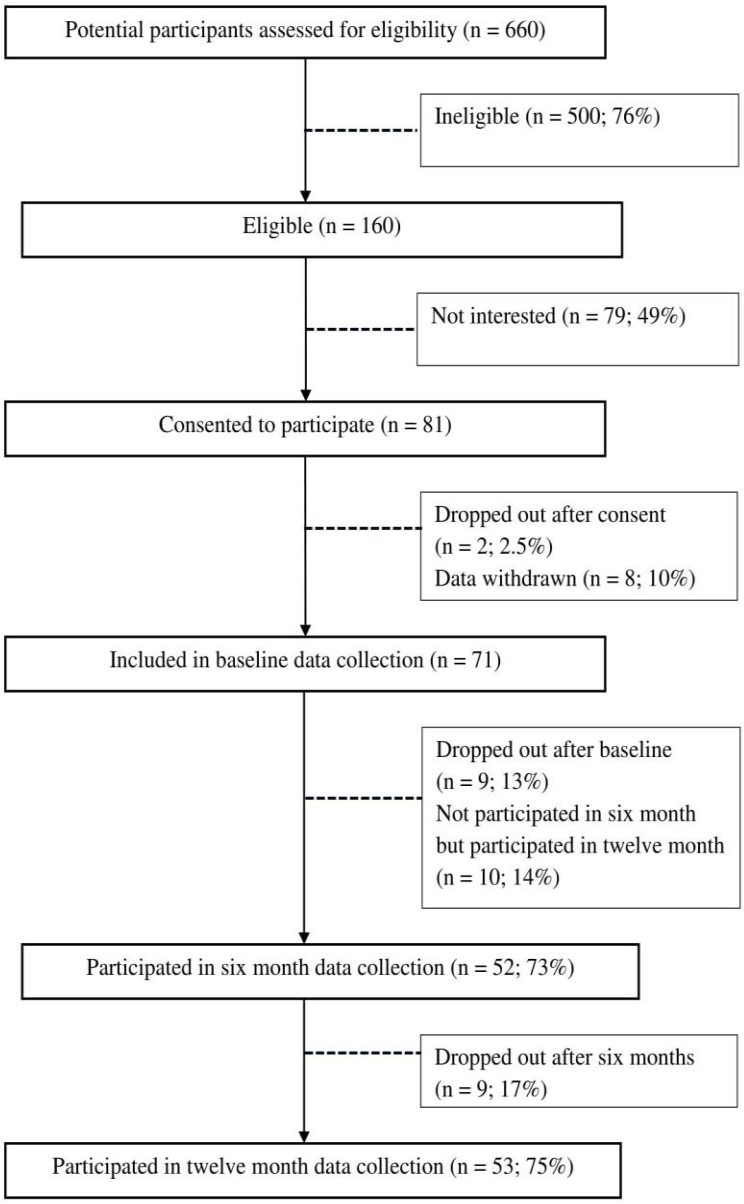
living too far away from St. John's) were encouraged to complete the psychological measures online (n = 3). For these three individuals, their self-reported weights were used to calculate their BMIs.

Three month assessment. Participants were contacted at three month follow-up via e-mail. Participants received a weblink to a brief follow-up survey and were asked to complete the survey on their home computer. The survey used the same secure online program as the other assessments in the study (i.e., Fluid Surveys). During the survey, participants were asked to self-report their current weight and complete the Emotional Eating Scale (EES: Arnow, Kenardy, & Agras, 1995). After completing the EES, participants were thanked for their time. The duration of this follow-up survey was approximately 20 minutes.

Six and twelve month assessments. One week prior to their scheduled follow-up session, participants received an email from the researcher reminding them of their upcoming appointment. In the email, participants were given information regarding the upcoming appointment and a link to the online survey containing the psychological questionnaires. If participants did not respond within a few days, the researcher sent a second e-mail asking him/her to confirm their attendance to the appointment. If the participant failed to respond, the researcher telephoned the participant to confirm their upcoming appointment. Participants who did not attend their twelve-month follow-up assessment, or who filled out the online portion of the study and did not report their weight, were contacted by email and were asked to self-report their weight to the researchers (see Appendix L).

At the follow-up appointment, the researcher reviewed the signed consent form from the previous assessment session and gave the participants an opportunity to ask any additional questions about the process. The remainder of the assessment was similar to the baseline assessment; however, participants also responded to two open-ended questions; "*How has shame helped or hindered your weight loss journey*?" and "*How has self-compassion helped or hindered your weight loss journey?*" (see Appendix H for responses for shame at six months, Appendix I for self-compassion at six months, Appendix J for shame at twelve months, and Appendix K for self-compassion at twelve months). Participants responded to these two questions by typing their answers into the online Fluidsurveys program. Responses were analyzed using a content analysis (Elo & Kyngäs, 2008), Responses were coded and grouped into the following categories: "helped, hindered, helped and hindered, not applicable", or "unclear". Responses in each category were examined for similar events and placed in context with the quantitative results.

Attrition. Of the 71 participants who completed the baseline assessment, nine participants dropped out of the study after the baseline assessment. Ten participants did not complete the six month assessment but did complete the twelve month assessment. At six months, 52 (73%) participants completed the assessment. Of these 52 participants, nine (17%) participants who completed both the baseline and six month assessments dropped out of the study. At twelve months, 53 (75%) participants participated in the assessment. In total, 18 participants (25% of the total sample) dropped out of the study over twelve months (see Figure 1 for participant flow diagram).



Fiigure 1. Participant flow diagram. Figure illustrating recruitment during the screening process and participant attrition over the study period.

Measures

Demographics and weight history. Detailed demographic information was collected via questionnaire (see Appendix B). Participants were asked questions regarding their age, gender, ethnic origin, level of education, and occupational status. Participants were also asked questions regarding their weight history, weight loss history, and intention regarding further weight loss. As maximum lifetime weight has been shown to significantly relate to weight regain (e.g., Byrne et al., 2004; Zwaan, Engeli, & Müller, 2015), it was also included in the weight history form and controlled in all regression analyses.

Depression, Anxiety, and Stress Scales -21item version (DASS-21; Antony, Bieling, Cox, Enna, & Swinson, 1998). The DASS-21 (see Appendix C) is a widely used 21-item self-report questionnaire designed to measure depression, anxiety, and stress. Participants are asked to report the frequency and severity of negative emotions they experienced over the previous week on a four-point likert scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much*). Higher scores are indicative of higher levels of depression, anxiety, or stress. The DASS-21 has demonstrated internal consistency and concurrent validity in the acceptable to excellent ranges. Cronbach's α for the DASS-21 subscales was reported to be .94 for Depression, .87 for Anxiety, and .91 for Stress (Antony et al., 1998). In the current study, only the depression subscale was used from the DASS-21. As depression is strongly associated with weight regain (likely due to overeating being a common symptom of depression; Buscemi, Castellini, Batsis, Ricca, Sprini, Galvano, & ... Rini, 2013), depression was controlled for in all regression analyses.

Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994). Eating disorder behaviour and attitudes were assessed using the Eating Disorders Examination Questionnaire (EDE-Q). The EDE-Q (see Appendix D) is a widely used measure of eating disorder psychopathology including dietary restraint, weight concern, shape concern and eating concern. Participants are also asked to report the frequency of disordered eating behaviours over the past four weeks including binge eating, self-induced vomiting and laxative misuse. The EDE-Q has demonstrated acceptable test-retest reliability with correlations ranging between .66 and .94 for the subscales, and between .51 and .92 for the behavioural indicators. Additionally, internal consistency for each of the subscales ranging from .70-.93 has been reported (Berg, Peterson, Fraizer, & Crow, 2012). The EDE-Q has demonstrated good concurrent validity and acceptable criterion validity (Mond, Hay, Rodgers, Owen, & Beumont, 2004).

In the current study, the EDE-Q was used to measure binge eating frequency over the past month. The EDE-Q's binge eating frequency indicator has demonstrated convergent validity with the interview version of the EDE for assessing binge eating behaviours (i.e., Eating Disorder Examination; Fairburn & Cooper, 1993). Several studies have reported that frequency ratings of binge eating on both measures demonstrated statistically significant correlations and did not differ significantly (e.g., Kalarchian, Wilson, Brolin, & Bradley, 2000). As such, the binge eating frequency behavioural indicator was used to assess binge eating behaviour within the current sample. As binge eating is associated with a risk for weight regain (e.g., McGuire et al., 1999), binge eating was controlled in all regression analyses.

Experiences of Shame Scale (EoS; Andrews, Qian, & Valentine, 2002). In order to assess experiences of shame, participants completed the 25-item EES (see Appendix E). Participants are asked to rate the extent to which they experience body, character, and behavior shame on a four-point likert scale ranging from 1 (*not at all*) to 4 (*very much*). The measure provides three subscale scores, as well as an overall score by taking the mean of all items. The total scale and three subscales showed a high internal consistency (Cronbach's alpha ranging from .86-.92). Research has shown the ESS to have good discriminant and construct validity, as well as high test-retest reliability (Andrews et al. 2002).

Self-Compassion Scale – Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011). Self-compassion was assessed using the 12-item Self-Compassion Scale-Short Form (SCS-SF). The SCS-SF (see Appendix F) asks participants to rate their typical reactions to distress and disappointment using a five-point likert scale from 1 (*almost never*) to 5 (*almost always*). Internal consistency for the SCS-SF is high (Cronbach's alpha = .86) and showed a near perfect correlation with the full-26 item self-compassion scale (Neff, 2011). In this study, only the total score for the SCS-SF was used, as scores from the individual subscales have been found to be less reliable (Raes et al., 2011).

Emotional Eating Scale (EES; Arnow, Kenardy, & Agras, 1995). The EES (see Appendix G) is a 25-item scale assessing relationships between specific negative emotional states (i.e. anger/frustration, anxiety, and depression) and urges to eat. Participants were asked to indicate the extent to which specific negative feelings precipitated to feel an urge to eat using a five-point likert scale from 0 (*no desire to eat*)

to 4 (*an overwhelming urge to eat*). All subscales have been shown to correlate highly with measures of binge eating and demonstrated no relationship with general measures of psychopathology (Arnow et al., 1995). Coefficient alphas for the total scale and subscales have indicated acceptable internal consistency (total = .81, anger/frustration = .78, anxiety = .78, and depression = .72) and test-retest correlation of the total score has indicated adequate temporal stability (r = .79, p < .001; Arnow et al., 1995).

Electronic survey. All of the data was collected and recorded electronically via Fluid Survey. Fluid Survey is a Canadian company that stores all the collected responses in Canada. This was important to ensure that the primary researchers retained ownership of the data. Fluid Survey also allowed for various response types, including typed responses. This allowed all the data to be stored in the same location.

Weight measurement. In order to ensure accurate assessment of weight, participants were weighed at the initial session and each follow-up session using a physician-grade electronic scale. The same scale was used for all participants.

Participants were also asked to self-report their weight at each data collection time point. While self-report is considered to be a fairly accurate tool to assess weight, individuals who are overweight or obese have been shown to underestimate or underreport their weight as compared to normal weight individuals (e.g., Larsen, Ouwens, Engels, Eisinga, & van Strien, 2008; Lassale, Péneau, Touvier, Julia, Galan, Hercberg, & Kesse-Guyot, 2013). The tendency to underreport weight has also been observed among dieters (McCabe, McFarlane, Polivy, & Olmsted, 2001).

At each time point, measured weight was typically used to calculate BMI. However, at each time point, several participants were unable to have their weight

measured in the lab. For these participants, self-reported weight was used as a proxy for measured weight. At baseline, sixty-eight participants had their weight measured and three participants self-reported their weight. At six months, forty-eight participants had their weight measured and four participants self-reported their weight. At twelve months, **f**orty participants had their weight measured and thirteen participants self-reported their weight.

Statistical Analyses

The statistical analyses for this study were conducted using IBM SPSS Statistics 23, a statistical software program. The raw data was screened for any potential outliers, normality of the data was examined for skewness and kurtosis, and reliability estimates for all measures were assessed. Next, descriptive statistics of the total sample were calculated. Variables assessed included baseline demographic variables (e.g., age, gender, relationship status, ethnicity, employment status, educational status, and highest educational level achieved), weight history variables (i.e., weight prior to weight loss, highest weight, highest BMI, how long ago at highest weight, how long at highest weight, lowest weight, and lowest BMI), and psychological variables (e.g., depression, binge eating, emotional eating, total shame, characterological shame, behavioural shame, bodily shame, and self-compassion).

Weight trajectories were examined over the twelve month follow-up period. A repeated measures ANOVA was used to determine whether mean BMI significantly changed over time. This analysis was performed to establish whether the overall sample maintained or regained their weight.

Based on individual weight trajectories, participants were divided into ‘weight regain’ and ‘weight non-regain’ groups at six and twelve months. To determine group belonging, baseline BMI was compared to BMI at both six months and twelve months. Difference scores were calculated between baseline BMI and both time points. Participants who gained back at least 5% of their body weight from baseline were placed in the regain group. All other participants were placed in the non-regain group. Descriptive statistics (i.e. means and standard deviations) were calculated for regainers and non-regainers at six months and twelve-months regarding weight history and psychological variables. To determine differences across psychological variables between groups over time, independent samples t-tests and Mann Whitney-U tests were employed. To determine changes across weight history and psychological variables within groups over time, repeated measures ANOVAS and Wilcoxon-signed rank tests were employed.

Tests pertaining to each hypothesis.

Hypothesis one: Shame and self-compassion will demonstrate a negative relationship over time. Baseline bivariate correlations of the main study variables were calculated. For shame and self-compassion, bivariate correlations were also conducted at six months and twelve months.

Hypothesis two: Baseline shame will be positively related to weight regain. Bivariate correlations between shame (and its respective facets), BMI, and change in BMI at six months and twelve months were performed to assess relationships between the variables in question. A hierarchical linear regression was conducted to determine whether baseline shame predicts weight change over time. Baseline shame was entered as

the independent predictor, and change in BMI was entered as the dependent variable. To control for baseline depression, binge eating, and maximum lifetime weight, these variables were entered in the first step of the regression equation. Using the same method, a second regression analysis was performed using the individual facets of shame (i.e., characterological shame, behavioural shame, and bodily shame) as independent predictors to gain a more nuanced understanding of relationships between shame and change in BMI. To further shed light on the relationships between shame and weight change, the qualitative question 'How has shame helped or hindered your weight loss journey?" was examined at six-months and twelve-months using a content analysis process (Elo & Kyngäs, 2008).

Hypothesis three: Baseline self-compassion will be positively related to weight loss maintenance. Bivariate correlations between self-compassion, BMI, and change in BMI at six months and twelve months were performed to assess relationships between the variables in question. A linear regression was conducted to determine whether baseline self-compassion predicted weight change. Baseline self-compassion was entered as the independent predictor, and change in BMI was entered as the dependent predictor. To control for baseline depression, binge eating symptomology, and maximum lifetime weight, these variables were entered in the first step of the regression equation.To further shed light on relationships between self-compassion and weight loss maintenance, the qualitative question 'How has self-compassion helped or hindered your weight loss journey?" was examined at six-months and twelve-months using a content analysis process (Elo & Kyngäs, 2008).

Hypothesis four: Emotional eating mediates or moderates the relationship between shame and weight regain.

Emotional eating as a mediator. Bivariate correlations between emotional eating and change in BMI at all time points were calculated to determine whether relationships exist between the key variables in question. The proposed mediation model for weight regain was tested using Baron and Kenny's (1986) steps for mediation analysis. The model was tested twice. In the first test, baseline shame was entered as the causal variable, emotional eating at three months as the proposed mediator, and change in BMI at six months as the dependent variable. In the second test, baseline shame was again entered as the causal variable, emotional eating at six months was entered as the proposed mediator, and change in BMI at twelve months was entered as the dependent variable.

Emotional eating as a moderator. Two multiple regression analyses were used to investigate whether the association between shame at baseline and BMI change depends on the degree of emotional eating at baseline. In the first analysis, baseline emotional eating and baseline shame were centered and the emotional eating-shame interaction term was computed. Next, the two predictors and the interaction term were entered into the regression model to test whether they significantly predicted BMI change at six months (Aiken & West, 1991). In the second analysis, the same method was employed; however, the dependent variable was BMI change at twelve months.

Results

Study Aims and Hypotheses

The purpose of this prospective longitudinal study was to investigate the roles of shame and self-compassion in predicting weight loss outcome in a community sample of obese individuals who had recently lost at least 5% of their body weight. There were four main hypotheses for this study. First, relationships between shame and self-compassion in an obese population were predicted to demonstrate a negative relationship. Second, baseline shame was predicted to be positively related to weight regain over time. Third, baseline self-compassion was predicted to be negatively related to weight regain over time. Finally, emotional eating was hypothesized to play a role in explaining or influencing the relationship between shame and weight regain. Specifically, the role of emotional eating as both a mediator and moderator of the relationship between shame and weight regain at six months and twelve months was tested.

Data Screening and Normality Testing

Data were screened for missing or incorrect data on a case-by-case basis. In the weight history forms, two participants reported 'lowest weight' data that were impossible given their age (i.e. the date of their lowest weight would have occurred prior to their births). These two data points were deleted from the database. Two participants reported highest past BMIs of 29.23 and 29.74, respectively. As participants needed to have met criteria for obesity prior to participating in the study (i.e., BMI $\geq$ 30), these two participants were deleted from the database.

Linearity was assessed by visual inspection; namely histograms and q-q plots. Potential outliers were examined by running a linear regression with shame, emotional

eating, self-compassion, and depression as independent variables, and BMI change between baseline and six months as the dependent variable. Standardized residuals of BMI change between baseline and six months, and baseline and twelve months, were assessed. Two participants' standardized residuals were -3.72 and 3.46 at six months, suggesting that both participants experienced a significant and unusually large amount of weight change in six months. Due to their extreme scores, both participants were excluded from the database.

Normality was assessed by calculating skewness and kurtosis for all measures. Skewness is a statistic used to measure the symmetry of a distribution (George & Mallery, 2010). Kurtosis is a measure of the peakedness and tailedness of a distribution (DeCarlo, 1997). In general, skewness and kurtosis values should fall within an absolute value of ±2 to be considered normal (George & Mallery, 2010; West, Finch, & Curran, 1995). Skewness values for all measures ranged from -.034 to 1.534 and kurtosis values for all measures ranged from -.080 to 1.819 (see Table 3). Taken together, skewness and kurtosis statistics indicate that the variables measured in this study sufficiently resembled a normal distribution.

Table 3

Skewness and kurtosis statistics for the Emotional Eating Scale (ESS); the Depression Anxiety Stress Scale – 21-Depression Subscale (DASS-21), the Experience of Shame Scale (EoS), the Experience of Shame Scale – Characterological (EoS-C), the Experience of Shame Scale – Behavioural (EoS-Be), the Experience of Shame Scale – Bodily (EoS-Bo), and the Self-Compassion Scale – Short Form (SCS-SF)

	Skewness (SE)	Kurtosis (SE)
EES (N = 64)	.642 (.299)	-.080 (.590)
DASS-21-D (N = 71)	1.534 (.285)	1.819 (.563)
SCS (N = 71)	-.034 (.285)	-.623 (.563)
EoS (N = 71)	.586 (.285)	-.251 (.563)
EoS-C	1.110 (.285)	1.347 (.563)
EoS-B	.475 (.285)	-.877 (.563)
EoS-Bo	.042 (.285)	-.868 (563)

Note. EES = Emotional Eating Scale (Arnow, Kenardy, & Agras, 1994); DASS-21 = Depression Anxiety Stress Scale (Antony, Bieling, Cox, Enns, & Swinson, 1998); SCS-SF = Self-Compassion Scale – Short Form (Raes, Pommier, Neff, & Van Gucht, 2011); EoS = Experience of Shame Scale (Andrews, Qian, & Valentine, 2002); EoS-C = Experience of Shame Scale – Characterological, EoS-B = Experience of Shame Scale – Behavioural, and EoS-Bo = Experience of Shame Scale – Bodily.

Descriptive Statistics and Reliability Estimates

Descriptive statistics and reliability estimates were assessed for the Emotional Eating Scale, the depression subscale of the DASS-21, the Self-Compassion Scale - Short Form, and the Experiences of Shame Scale at baseline (see Table 4). The coefficient alphas obtained in this study ranged from .86 to .94 across these measures, indicating good to excellent internal consistencies (Nunnally, 1978).

Mean scores for all measures at baseline fell within appropriate ranges, suggesting that the measures were completed accurately (see Table 4). Based on a five-

point classification system (i.e., Normal – Mild – Moderate – Severe – Extremely Severe), the mean score for the depression subscale of the DASS-21 fell within the normal severity limits (Antony et al., 1998). This indicates that, as would be expected in a community sample, the scores resembled a sample of nonclinical volunteers rather than a sample of individuals diagnosed with major depressive disorder (see Antony et al., 1998). For the Self-Compassion Scale-Short Form, community and clinical norms have yet to be established. As compared to a university population, the mean and standard deviation in this study were found to be approximately two to three points higher (see Raes et al., 2011). On the Experience of Shame Scale, specific severity ratings according to community or clinical norms for the experiences of shame scale have yet to be determined. As compared to an undergraduate sample of students, participants in this study scored lower on the overall mean shame score, on the characterological shame subscale, and on the behavioural shame subscale. Conversely, participants in this study scored higher on the bodily shame subscale (see Andrews et al., 2002). On the Emotional Eating Scale, the mean total score in this non-clinical sample was found to be substantially lower than the mean of a clinical sample of women with obesity (mean = 51.15; see Arnow et al., 1995).

Table 4

Descriptive statistics and reliability estimates of the Emotional Eating Scale (ESS); the Depression Anxiety Stress Scale – 21-Depression Subscale (DASS-21), the Experience of Shame Scale (EoS), the Experience of Shame Scale – Characterological (EoS-C), the Experience of Shame Scale – Behavioural (EoS-Be), the Experience of Shame Scale – Bodily (EoS-Bo), and the Self-Compassion Scale – Short Form (SCS-SF)

	Mean	S.D.	Range	Coefficient alpha
EES (N = 64)	27.19	15.46	2-65	.93
DASS-21-Q (N = 71)	2.68	3.42	0-15	.92
SCS (N = 71)	38.39	10.24	16-57	.89
EoS (N = 71)	48.73	14.87	25-89	.94
EoS-C	21.11	7.49	12-47	.92
EoS-B	17.73	6.34	9-32	.90
EoS-Bo	9.89	3.24	4-16	.86

Note. EES = Emotional Eating Scale (Arnow, Kenardy, & Agras, 1994); DASS-21 = Depression Anxiety Stress Scale (Antony, Bieling, Cox, Enns, & Swinson, 1998); SCS-SF = Self-Compassion Scale – Short Form (Raes, Pommier, Neff, & Van Gucht, 2011); EoS = Experience of Shame Scale (Andrews, Qian, & Valentine, 2002); EoS-C = Experience of Shame Scale – Characterological, EoS-B = Experience of Shame Scale – Behavioural, and EoS-Bo = Experience of Shame Scale – Bodily.

The binge eating question from the EDE-Q (question 14) at baseline was examined using a frequency analysis (N = 71). Participants were asked to respond how many times they engaged in binge eating behaviour in the past 28 days. Participants who did not respond with one numerical value had their responses coded accordingly (see Table 5).

Table 5

Coding of EDE-Q-14 written answers

Response	Coding

Never, N/A	0
Not sure	Left blank
Not very much, not often	1
Gave a range (e.g. 2-4)	Took the mean (e.g. 3)
Listed two consecutive number (e.g.1 or 2)	Took the mean (e.g. 1.5)
Descriptive answer (e.g. "Friday afternoons and Easter weekend")	Counted each event as one time (e.g. 5)

Overall, approximately 39% of participants engaged in at least one episode of binge eating within the past 28 days at baseline. This is similar to the findings of previous research assessing the prevalence of objective binge eating episodes using the EDE-Q within obese populations (e.g., 38%; Aardoom, Dingemans, Slof Op't Landt, & Van Furth, 2012). Participants responded that the mean number of binge eating episodes in the past 28 days was 1.40, with a standard deviation of 3.17. The range in binge eating episodes was from 0 to 20. Results from the frequency analysis are presented below (see Table 6).

Table 6

Frequency distribution of binge eating episodes as measured by question #14 from EDE-Q: "Over the past 28 days, how many times have you eaten what other people would regard as an unusually large amount of food (given the circumstances) and on how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)?" (N = 71)

	Frequency	Valid Percent	Cumulative Percent

0	43	61.4	61.4
1	7	10.	71.4
2	10	14.	85.7
3	1	1.4	87.1
4	4	5.7	92.9
5	2	2.9	95.7
8	1	1.4	97.1
14	1	1.4	98.6
20	1	1.4	100.0
Total	70	98.6	100.0
Missing	1	1.4	
Total	71	100.0	

Participant Characteristics

Demographics. Seventy-one participants were included in the final sample. Participants ranged in age from 18-58 years (M = 38.93, SD = 10.33). Most participants were female (63.4%), married or common law (66.2%), and employed (81.7%). Most participants were Caucasian (94.4%), reflecting the racial make-up of Newfoundland (Statistics Canada, 2006). The tertiary education level attained by participants (~80% when combining college, undergraduate, and graduate programs) was higher than the provincial average of 37% (Statistics Canada, 2012). See Table 7 for a summary of participant demographic information.

Table 7

Participant demographic information (N = 71)

	Frequency	%
Gender		
Male	26	36.6
Female	45	63.4
Relationship status		
Married/Common law	47	66.2
Single	15	21.1
In a relationship	5	7.0
Divorced	1	1.4
Other	3	4.2
Ethnicity		
Caucasian	67	94.4
Middle Eastern	1	1.4
Not reported	1	1.4
Other	2	2.8
Employment status		
Employed	58	81.7
Not employed	13	18.3
Educational status		
Student	20	28.2
Not student	50	70.4
Not reported	1	1.4
Highest education level		
Undergraduate/College	44	62.0
Graduate school	13	18.3
Some post-secondary	13	18.3
High school diploma	1	1.4

Weight variables.

Intention for weight loss. At baseline, most participants reported that they intended to keep losing weight (n = 35, 49.3%) as opposed to trying to maintain their

weight loss (n = 3, 4.2%). Thirty-three participants (46.5%) did not have the opportunity to report their intention for weight loss, as the question was added to the baseline assessment battery after their baseline appointments had already occurred.

BMI trajectories. A one-way repeated measures ANOVA was conducted to compare the effect of time on mean BMI for the overall sample at baseline, six months, and twelve months follow-up. Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated, $\chi^2(2) = 7.467$, $p = .024$. Using a Greenhouse-Geisser correction, mean BMI did not significantly change over time, F (1.71, 72.01) = .188, p = .796. This indicates that, on average, participants maintained their weight loss over the twelve month follow-up period.

Although the total sample maintained their weight loss, it was thought that certain participants may have experienced weight regain over time. Thus, difference scores were calculated between baseline BMI and BMI at six months and twelve months to divide participants into 'weight regain' and weight 'non-regain' groups. Participants who gained back at least 5% of their body weight from baseline were placed in the weight regain group. All other participants were placed in the weight non-regain group. Results show that at six months, 10 participants (19%) regained at least 5% of their baseline body weight and 42 participants (81%) maintained their weight loss or continued to lose weight. At twelve months, 11 participants (21%) regained at least 5% of their baseline body weight and 42 participants (79%) maintained their weight loss or continued to lose weight. In total, 18 out of the 69 participants (26%) whose BMI was calculated at the six month or twelve month follow-up had gained back at least 5% of their body weight at some point within one year. Table 8 presents the BMI trajectories of participants in each

of these subgroups. Figure 2 shows the average BMI trajectories of regainers and non-regainers from baseline to twelve month follow-up.

Table 8

BMI statistics for total sample, regainers and non-regainers over time

	Total Sample M (SD)	*Non-Regainers M (SD)*	*Regainers M (SD)*
Baseline (N = 71)	31.66 (5.03)	N/A	N/A
Six month (N = 52)	31.28 (5.27)	30.43 (4.40) (N = 42)	34.83 (7.21) (N = 10)
Twelve month (N = 53)	31.48 (5.34)	30.50 (5.06) (N = 42)	35.23 (4.87) (N = 11)

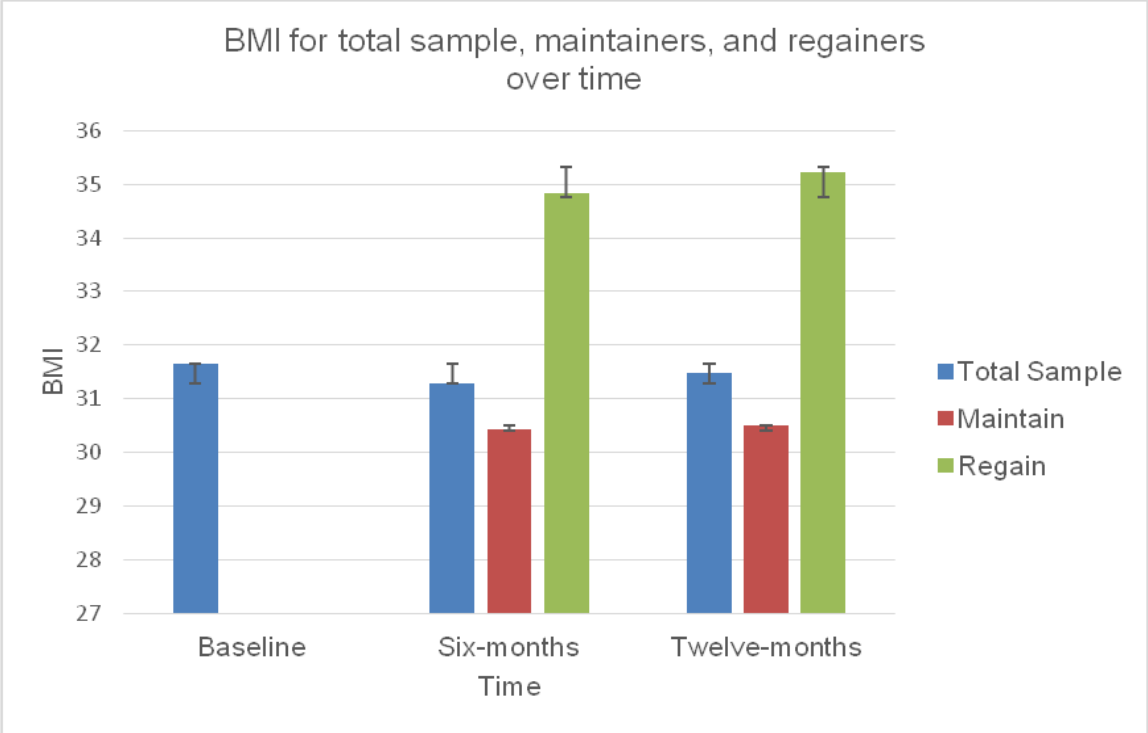


Figure 2. BMI trajectories of total sample, maintainers, and regainers from baseline to twelve month follow-up.

Group membership and attrition. Participants at each time point were compared to each other to explore whether group membership (e.g., regainers and non-regainers) appeared to have affected attrition rates over time. Results indicate that at baseline, seventy-one participants reported their weight. At six months, fifty-two participants reported their weight, and nine of these participants dropped out of the study by twelve months. Of these nine participants, two had regained weight at six months. At twelve months, fifty-three participants reported their weight, and ten of these participants did not report their weight at six months. Of these ten participants, two had regained weight since baseline. Taken together, these results suggest that weight regain likely did not play a significant role in attrition rates, as more participants who did not report their weight at follow-up experienced weight loss maintenance rather than weight regain at the previous assessment.

Weight history variables. Weight history variables were compared between those who were classified as regainers and non-regainers at six and twelve months. Results indicate that non-regainers were at their highest weight for a longer period of time, and at their lowest weight for a longer period of time. Regainers reported a history of having lower previous BMIs than non-regainers. Taken together, these results suggest that non-regainers may have engaged in a 'slower but steadier' form of weight loss where weight was slowly lost over time, while regainers may have engaged in more rapid diet cycling (i.e., quicker weight gain and weight loss). Results are presented in Table 9.

Table 9

Weight history variables for total sample (N = 71) at baseline, for non-regainers (N=42) and regainers (N=10) at six months, and for non-regainers (N=42) regainers (N=11) at twelve months

	Total Sample *M (SD*)	Non-Regainers 6m *M (SD*)	Regainers 6m *M (SD*)	Non-Regainers 12m *M (SD*)	Regainers 12m *M (SD*)
Weight prior to weight loss (kg)	110.58 (23.84)	107.60 (22.17)	114.53 (30.30)	110.29 (23.50)	105.08 (17.95)
How long ago started to lose weight (months)	12.75 [a] (21.42)	10.17 [b] (10.95)	25.44 [c] (49.96)	13.46 (25.67)	12.50 [d] (10.51)
Highest weight (kg)	113.62 (24.77)	111.79 (24.49)	117.39 (27.05)	114.07 (25.40)	107.65 (18.17)
How long ago at highest weight (months)	46.54 (80.54)	64.10 (99.49)	30.50 (34.31)	54.43 (98.82)	54.73 (54.99)
How long at highest weight (months)	18.25 (22.27)	17.93 (20.34)	14.00 (13.31)	17.50 (20.54)	10.27 (9.91)

Highest BMI	39.36 (8.03)	38.74 (7.86)	41.00 (8.45)	40.00 (8.42)	38.15 (5.72)
Lowest weight (kg)	75.88 (15.92)	75.35 (15.95)	73.35 (17.64)	74.07 (14.75)	70.31 (15.38)
How long ago at lowest weight (months)	157.78 (128.48)	170.51 (139.46)	173.58 [c] (83.50)	193.04 (130.17)	152.40 [d] (129.04)
How long at lowest weight (months)	30.03 (36.26)	30.14 (38.08)	27.22 [c] (25.39)	33.11 (38.18)	22.80 [d] (25.42)
Lowest BMI	26.14 (4.30)	25.96 (4.08)	25.57 (4.87)	25.82 (3.84)	24.75 (4.13)

[a] N = 60 at baseline.

[b] N = 35 in six month weight non-regain group.

[c] N = 9 in six month weight regain group.

[d] N = 10 in twelve month weight regain group.

Psychological variables.

Trends for psychological variables between groups over time. Baseline scores on the psychological variables were compared between groups (i.e., regainers and non-regainers) at six and twelve months (see Table 10). For all continuous data, independent samples t-tests were used to compare scores at six months and twelve months. Those

who were classified as regainers at six months reported significantly lower baseline bodily shame (t (50) = 2.29, p = 0.026) and significantly higher baseline self-compassion (t (50) = -2.53, p = 0.015) than those who classified as non-regainers at six months. Regainers also demonstrated a trend towards lower baseline total shame (t (50) = 1.81, p = 0.076) as compared to non-regainers at six months. At twelve months, there were no significant baseline differences on any of the psychological variables between groups.

Mann-Whitney U tests were used to examine if binge eating frequency at baseline (i.e. question #14 on the EDEQ) was associated with weight change over time. At six months, there were no significant differences between regainers (mean rank = 24.89) and non-regainers (mean rank = 26.24) on baseline binge eating frequency (U = 179.00, z = -.286, p = .79). However, at twelve months, baseline binge eating frequency was significantly higher for those classified as regainers (mean rank = 37.09) than for non-regainers (mean rank = 24.36; U = 120.00, z = -2.762, p = .005).

Taken together, these results indicate that lower baseline bodily shame and higher baseline self-compassion were the only variables associated with weight regain at six months. These results were surprising and contrary to predictions that shame would be positively associated with weight regain and self-compassion would be positively associated with non-regain. At twelve months, these findings disappeared and binge eating frequency was the only variable to be significantly associated with weight regain. This finding is not surprising and is in line with previous literature that indicates increased binge eating predicts weight regain over time. Results suggest that interpreting the influence of baseline characteristics on weight regain is dependent on when the data

is analyzed, and further suggests the importance of using multiple time points when examining relationships between psychological variables and weight regain.

Table 10

Mean scores on baseline psychological variables for total sample (N = 71), non-regainers at six months (M = 42), regainers at six months (N = 10), non-regainers at twelve months (N =42), and regainers at twelve months (N =11).

	Baseline Total Sample *M (SD)*	Non-regainers 6m *M (SD)*	Regainers 6m *M (SD)*	Non-regainers 12m *M (SD)*	Regainers 12m *M (SD)*
Depression	2.68 (3.42)	3.00 (3.79)	2.20 (2.70)	2.36 (3.52)	3.18 (3.09)
Binge Eating[α]	1.40 (3.17)	1.45 (3.39)	1.89 (4.59)	1.07 (2.60)	3.73 (5.71)
Emotional Eating[c]	27.19 (15.45)	24.96 (15.00)	25.00 (12.23)	28.28 (14.93)	31.14 (25.45)
Shame	48.73 (14.87)	50.26 (15.03)	41.00 (12.06)	48.83 (15.78)	47.27 (16.06)
Character Shame	21.11 (7.49)	21.67 (8.11)	18.40 (5.46)	21.21 (8.24)	20.00 (5.83)
Behavioural Shame	17.73 (6.33)	18.12 (6.04)	14.60 (6.90)	17.52 (6.30)	18.09 (7.84)
Bodily Shame	9.89 (3.24)	10.48 (3.22)	8.00 (2.31)	10.09 (2.97)	9.18 (4.04)

Self-Compassion	38.39 (10.24)	36.48 (9.77)	45.10 (9.33)	37.64 (9.57)	39.45 (9.57)

[α] N = 70 at baseline. At six months, N = 9 in the regain group.

[b] N = 64 at baseline. At six months, N = 39 in the non-regain group and N = 7 in the regain group. At twelve months, N = 41 in the non-regain group and N = 7 in the regain group.

Trends for psychological variables within groups over time. Descriptive statistics for all continuous psychological variables (i.e., emotional eating, depression, self-compassion, total shame, characterological shame, behavioural shame, and bodily shame) were assessed for the total sample, non-regainers, and regainers at baseline, six months, and twelve months (see Table 11).

Table 11

Emotional eating, depression, self-compassion, and shame for total sample, non-regainers, and regainers over time.

	Total Sample M (SD)	*Non-regainers M (SD)*	*Regainers M (SD)*
Emotional Eating			
Baseline	27.19 (15.46) N = 64	N/A	N/A
Six months	24.52 (15.84) N = 52	23.22 (13.99) N = 41	31.20 (21.78) N = 10
Twelve months	24.50 (17.78) N = 42	22.91 (15.38) N = 32	29.60 (24.23) N = 10

Depression			
Baseline	2.68 (3.42) N = 71	N/A	N/A
Six months	3.57 (3.91) N = 52	3.55 (4.02) N = 40	4.00 (3.68) N = 10
Twelve months	3.71 (3.86) N = 53	3.25 (3.63) N = 32	5.20 (4.39) N = 10
Self-compassion			
Baseline	38.39 (10.24) N = 71	N/A	N/A
Six-months	39.33 (10.13) N = 52	38.19 (10.20) N = 41	43.50 (9.55) N = 10
Twelve-months	39.21 (10.21) N = 42	39.06 (9.91) N = 32	39.70 (11.69) N = 10
Shame			
Baseline	N = 71	N/A	N/A
Total	48.73 (14.87)		
Characterological	21.11 (7.49)		
Behavioural	17.73 (6.34)		
Bodily	9.89 (3.24)		
Six-months	N = 52	N = 41	N = 10
Total	44.88 (13.62)	44.93 (13.62)	45.20 (14.95)
Characterological	19.42 (6.64)	19.39 (6.83)	19.90 (6.44)
Behavioural	16.77 (6.36)	16.98 (6.32)	16.00 (7.12)
Bodily	8.69 (3.19)	8.56 (3.08)	9.30 (3.86)
Twelve-months	N = 42	N = 32	N = 10
Total	46.24 (15.28)	45.87 (14.59)	47.40 (18.12)
Characterological	20.02 (6.98)	20.12 (6.88)	19.70 (7.69)
Behavioural	17.50 (7.05)	17.37 (7.03)	17.90 (7.49)
Bodily	8.71 (3.34)	8.37 (3.07)	9.80 (4.10)

Repeated measures ANOVAS were used to compare group means for each variable at baseline, six months, and twelve months follow-up. For all ANOVAS, if Mauchly's test of sphericity indicated that the assumption of sphericity had not been met (i.e., $p < .05$), the Greenhouse-Geisser correction was used to alter degrees of freedom and reduce the Type 1 error rate. If the ANOVA was significant (i.e., $p < .05$), the Bonferroni correction was used during follow-up pairwise comparisons to control for the familywise Type 1 error rate.

Emotional eating. Results from two repeated measures ANOVAs indicate that emotional eating did not significantly change over time for regainers (F (2, 162.50) = 2.14, p = .168) or non-regainers, F (2, 205.17) = 2.21, p = .120.

Depression. Results from two repeated measures ANOVAs indicate that depression did not significantly change over time for regainers (F (2, 15.81) = 1.72, p = .210) or non-regainers, F (2, 10.72) = 2.60, p = .084.

Self-compassion. Results from two repeated measures ANOVAs indicate that self-compassion did not significantly change over time for regainers (F (2, 6.70 = .237, p = .791) or non-regainers, F (2, 30.08) = 1.29, p = .283.

Total shame. A repeated measures ANOVA with a Greenhouse Geisser correction was used to assess change in shame over time for regainers, as sphericity had not been met, $\chi^2(2) = 5.99$, p = .05. Results indicate that total shame did not significantly change over time for regainers, F (1.27, 60.43) = .322, p = .625. A second repeated measures ANOVA with a Greenhouse Geisser correction was used to assess change in shame over time for non-regainers, as sphericity had not been met, $\chi2(2) = 9.74$, p = .008. Results indicate that total shame differed statistically significantly between time points, F (1.52,

195.56) = 3.57, p = .049. Post hoc tests using the Bonferroni correction revealed that there was a reduction in shame from baseline to six months (49.75 ± 16.26 vs. 46.75 ± 15.32, respectively), which was not statistically significant (p = .460). However, by twelve months, shame had been further reduced to 45.21 ± 14.30 and approached significance from baseline (p = .062). This suggests that among non-regainers, shame decreases over time and approaches a significant reduction from baseline by twelve months.

Characterological shame. Results from two repeated measures ANOVAs indicate that characterological shame did not significantly change over time for regainers (F (2, 4.037) = .123, p = .885) or non-regainers (with Greenhouse-Geisser correction: F (1.60, 23.88) = 1.50, p = .235).

Behavioural shame. Results from two repeated measures ANOVAs indicate that emotional eating did not significantly change over time for regainers (with Greenhouse-Geisser correction: F (1.25, 10.02) = 0.48, p = .546) or non-regainers, F (2, 4.18) = .477, p = .623.

Bodily shame. A repeated measures ANOVA with a Greenhouse-Geisser correction was used to assess change in bodily shame over time for regainers as sphericity had not been met, $\chi^2(2) = 7.88$, p = .019. Results indicate that bodily shame did not significantly change over time for regainers, F (1.19, 6.39) = .948, p = .372. A second repeated measures ANOVA indicated that bodily shame differed statistically significantly between time points for non-regainers, F (2, 38.23) = 9.49, p < .001. Post hoc tests using the Bonferroni correction revealed that there were significant reductions in bodily shame from baseline to six months (10.43 ± 3.25 vs. 9.04 ± 3.17; p = .036) and

from baseline to twelve months (10.43 ± 3.25 vs. 8.12 ± 3.03; p = .002). This suggests that among non-regainers, bodily shame significantly decreases over time as weight loss is maintained.

Binge eating. Descriptive statistics for binge eating frequency at baseline, six-months, and twelve-months for the total sample, non-regainers, and regainers are presented in Table 12.

Table 12

Binge eating frequency for total sample, regainers, and non-regainers over time.

	Total Sample *M (SD)* *Range* *N*	*Non-regainers* *M (SD)* *Range* *N*	*Regainers* *M (SD)* *Range* *N*
Binge eating			
Baseline	1.40 (3.17) 0-20 N = 70	N/A	N/A
Six months	2.82 (5.64) 0-35 N = 51	1.85 (2.57) 0-10 N = 41	7.44 (11.68) 0-35 N = 9
Twelve months	1.89 (3.64) 0-15 N = 35	1.61 (3.06) 0-10 N = 28	3.00 (5.60) 0-15 N = 7

To examine changes in binge eating frequency among regainers and non-regainers over time, Wilcoxon signed-rank tests were employed. Among regainers, at six months, binge eating frequency did not significantly change from baseline (z = -1.48, p = .188). Among regainers, at twelve months, binge eating frequency did not significantly change from baseline (z = -.368, p = .750) or six months (z = .000, p = 1.000). Among non-regainers at six months, binge eating frequency did not significantly change from

baseline (z = -1.40, p = .166). Among non-regainers at twelve months, binge eating frequency did not significantly change from baseline (z = -.428, p = .687) or six months (z = -1.58, p = .124).

Hypothesis Testing

Prior to testing the study hypotheses, baseline bivariate correlations were performed between all main study variables to gain a preliminary understanding of the data (see Table 13). Most results from these correlations supported previous research findings including: 1) an inverse relationship between baseline shame and self-compassion; 2) a positive association between shame and depression; 3) a negative association between self-compassion and depression; 4) a positive relationship between bodily shame and emotional eating; and 5) positive relationships between emotional eating, binge eating, and BMI. Surprisingly, emotional eating was unrelated to total shame, characterological shame, or behavioural shame. This suggests that bodily shame may be specifically associated with emotional eating; however, it may also indicate that there was not enough variance within the sample to detect an effect. Furthermore, it was found that BMI was positively associated with emotional eating but not binge eating. This suggests that in this community sample, eating in response to emotions may play an important role in influencing weight regain, and further suggests that the frequency of binge eating behaviours may not have been sufficient to contribute to increased weight.

Table 13

Bivariate correlations between all study variables at baseline including BMI (T1BMI), binge eating as measured by the Eating Disorder Examination-Questionnaire question #14,, the Emotional Eating Scale (EES), the Depression Anxiety Stress Scale – 21 –

Depression subscale (DASS-21-D), the Experience of Shame Scale (EoS), the Experience of Shame Scale- Characterological (EoS-C), the Experience of Shame Scale-Behavioural (EoS-Be), the Experience of Shame Scale- Bodily (EoS-Bo), and the Self-Compassion Scale – Short Form (SCS-SF).

	T1BMI	Binge Eating	Emotional Eating	Depression	Shame	Self-Compassion
Binge Eating	.135 N(70)	-				
Emotional Eating	**.380** N(64)**	**.428** N(64)**	-			
Depression	-.158 N(71)	-.025 N(70)	-.018 N(66)	-		
Total Shame	.038 N(71)	.032 N(70)	.123 N(64)	**.632** N(71)**	-	
Character-ological Shame	-.028 N(71)	-.028 N(70)	.026 N(64)	**.657** N(71)**	**.915** N(71)**	**-.611** N(71)**
Behavioural Shame	.040 N(71)	.006 N(70)	.090 N(64)	**.565** N(71)**	**.905** N(71)**	**-.639** N(71)**
Bodily Shame	.161 N(71)	.201 N(70)	**.317* N(64)**	**.336* N(71)**	**.704** N(71)**	**-.583** N(71)**
Self-Compassion	-.027 N(71)	-.168 N(70)	-.240 N(64)	**-.611** N(71)**	**.707** N(71)**	1 N(71)

Note. EDE-Q = Eating Disorder Examination-Questionnaire (EDE-Q : Fairburn & Belgin, 1994); the Emotional Eating Scale (EES ; Arnow, Kenardy, & Agras, 1994); Depression Anxiety Stress Scale – 21 (DASS-21; Antony, Bieling, Cox, Enns, &

Swinson, 1998); Experience of Shame Scale (EoS; Andrews, Qian, & Valentine, 2002), and the Self-Compassion Scale – Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011).

p<.05 (two-tailed),p* < .01 *(two-tailed)*

Hypothesis one: Shame and self-compassion will demonstrate a negative relationship over time. Bivariate correlations were performed between shame and self-compassion at baseline, six months, and twelve month follow-up. Results supported hypothesis one, as significant negative relationships were found between shame and self-compassion at baseline, six months, and twelve months (see Table 14).

Table 14

Bivariate correlations between total shame (EoS) and self-compassion (SCS-SF) at baseline, six months, and twelve months.

	Baseline SCS-SF	Six months SCS-SF	Twelve months SCS-SF
Baseline EoS	-.707** (N = 71)	.-631** (N = 52)	-.635** (N = 42)
Six-months EoS	-.602** (N = 52)	.-649** (N = 52)	-.710** (N = 37)
Twelve-months EoS	-.592** (N = 42)	-.535** (N = 37)	-.720** (n = 42)

Note. Experience of Shame Scale (EoS; Andrews, Qian, & Valentine, 2002) and the Self-Compassion Scale – Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011).

***p* ≤ .001 *(two-tailed*

Hypotheses two and three: Baseline shame will be positively related to weight regain and baseline self-compassion will be positively related to weight loss maintenance.

Relationships between shame, self-compassion, and BMI over time. Hypotheses two and three predicted that shame would be positively related to weight regain over time, and self-compassion would be positively related to weight loss maintenance over time. To investigate these hypotheses, bivariate correlations between baseline shame, baseline self-compassion, and change in BMI were performed. To assess change in BMI, difference scores were calculated for BMI between baseline and six months, and baseline and twelve months. Baseline shame (and all components) was negatively associated with change in BMI at six months; that is, higher baseline shame was related to a decrease in BMI at six months. Baseline self-compassion was positively associated with change in BMI at six months; that is, higher baseline self-compassion was related to an increase in BMI at six months. However, none of these relationships were sustained at twelve months. Results are presented in Table 15.

Table 15

Bivariate correlations between BMI change (Δ BMI), baseline total shame (ESS), baseline

shame subscales (ESS-C, ESS-B, ESS-Bo), and baseline self-compassion (SCS-SF).

	Δ BMI B_M6 (N = 52)	Δ BMI B_M12 (N = 53)
EoS	**-.388****	-.186

EoS-C	**-.291***	-.184
EoS-B	**-.302***	-.121
EoS-Bo	**-.502****	-.219
SCS-SF	**.339***	.132

Note. Δ BMI B_M6: baseline to six months, Δ BMI B_M12: baseline to twelve months, Experience of Shame Scale (EoS; Andrews, Qian, & Valentine, 2002), characterological shame (EoS-C), behavioural shame (EoS-B) bodily shame (EoS-Bo), and the Self-Compassion Scale – Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011). **p<.05 (two-tailed),**p* < .01 *(two-tailed).*

To investigate whether shame and self-compassion predicted change in BMI at six months, hierarchical multiple linear regression analyses were used.

Shame and change in BMI at six months. To examine whether baseline shame predicted weight regain at six months, a hierarchical multiple regression analysis was performed. The independent variable (shame) was initially assessed for collinearity. Results of the collinearity tolerance (.485) support that the estimated *β*s of the coefficients for the dependent variables were well established in all of the regression models. Change in BMI from baseline to six-months was used as the dependent variable. In the first step of the regression model, depression, binge eating, and maximum lifetime weight were entered as predictor variables to control for their influence on the dependent variable, as previous research suggests that these variables are related to weight gain over time (e.g., Byrne et al., 2004; McGuire et al., 1999). These variables accounted for 2.2% of the variance in weight change at six-month, F (3,47) = .359, p = .783. None of the

variables significantly contributed to the model. This step of the regression model was replicated in subsequent hierarchical regression analyses.

Baseline shame was entered in the second step. Shame significantly accounted for an additional 24.5% of the variance in BMI change from baseline to six-month follow-up, ΔF (1,46) = 15.40, p = <.001. With the addition of shame to the model, depression also became a statistically significant predictor (t = 2.55, p = .014), suggesting that shame was highly correlated with depression. The final model accounted for a total of 26.8% (F (4,46) = 4.20, p =.006) of variance in BMI change at six-months (see Table 16 for regression coefficients). In summary, these results suggest that baseline shame is a strong predictor of weight change over time. Contrary to expectations, however, higher levels of baseline shame did not predict weight regain at six months; rather, higher baseline shame predicted greater weight loss or weight loss maintenance at six months.

Table 16

Hierarchical multiple regression analysis predicting change in BMI at six months from depression, binge eating, maximum lifetime weight, and shame (N = 51)

		B	*SE*	*β*	*t*
Step 1					
	Constant	-.121	1.332		-.091
	Highest weight	.002	.011	.021	.142
	DASS-21-D	-.025	.075	-.049	-.332
	EDE-Q-14	.071	.076	.139	.943
Step 2					
	Constant	2.74	1.37		1.99
	Highest weight	.007	.010	.095	.721
	DASS-21-D	.241	.095	.468	2.55*
	EDE-Q-14	.078	.066	.153	1.183
	EoS	-.087	.022	-.711	-3.92**

Note. DASS-21-D = Depression Anxiety Stress Scale – Depression (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998); EDE-Q-14 = Eating Disorder Examination-Questionnaire (EDE-Q : Fairburn & Belgin, 1994); and the Experience of Shame Scale (EoS; Andrews, Qian, & Valentine, 2002),

* $p < .05$, ** $p < .01$, (two-tailed).

To explore whether the individual components of baseline shame (i.e. characterological, behavioural, and bodily) predicted change in BMI at six months, another hierarchical multiple regression analysis was performed. The independent variables were initially assessed for collinearity. Results of the collinearity tolerance (range = .472-.844) support that the estimated βs of the coefficients for the dependent variables were well established in the regression models. After completing the first step of the regression analysis, baseline characterological shame, behavioural shame, and bodily shame were entered into the model. The addition of these variables accounted for an additional 31.9% of the variance in BMI change, ΔF (3,44) = 7.10, p = .001. In examining the unique relationships between the individual components of shame and weight change at six months, only bodily shame was found to significantly contribute to the model (see Table 17 for regression coefficients). This indicates that higher baseline bodily shame independently predicted greater weight loss or weight loss maintenance at six months after controlling for depression, binge eating, and maximum lifetime weight. It further indicates that characterological shame and behavioural shame did not independently predict change in BMI at six months. The total model accounted for 34.1% of the variance in BMI change six-months, F (6,44) = 3.80, p =.004.

Table 17

Hierarchical multiple regression analysis predicting change in BMI at six months from depression, binge eating, maximum lifetime weight, characterological shame, behavioural shame, and bodily shame (N = 51)

		B	*SE*	*β*	*t*
Step 1					
	Constant	-.121	1.332		-.091
	Highest weight	.002	.011	.021	.142
	DASS-21-D	-.025	.075	-.049	-.332
	EDE-Q-14	.071	.076	.139	.943
Step 2					
	Constant	2.45	1.36		1.80
	Highest weight	.010	.010	.141	1.07
	DASS-21-D	.154	.100	.361	1.87
	EDE-Q-14	.123	.067	.240	1.83
	EoS-C	-.038	.048	-.160	-.780
	EoS-Be	-.026	.055	-.088	-.466
	EoS-Bo	-.291	.094	-.508	-3.09*

Note. DASS-21-D = Depression Anxiety Stress Scale – Depression (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998); EDE-Q-14 = Eating Disorder Examination-Questionnaire (EDE-Q : Fairburn & Belgin, 1994); EoS - C, Be, Bo = Experiences of Shame Scale – Characterological, Behavioural, and Bodily Shame (EoS; Andrews, Qian, & Valentine, 2002),

*p = .003 (two-tailed).

Self-compassion and change in BMI at six months. To examine the degree to which baseline self-compassion predicted change in BMI at six months, a hierarchical regression was performed. The independent variable (self-compassion) was initially assessed for collinearity. Results of the collinearity tolerance (.526) support that the estimated βs of the coefficients for the dependent variables were well established in the

regression models. After completing the first step of the regression analysis, self-compassion was entered into the model. Self-compassion significantly accounted for an additional 14.6% of the variance in weight change, ΔF (1,46) = 8.07, p = .007. The final model accounted for a total of 16.8% of the variance in change in BMI at six-months and was not statistically significant, F (4,46) = 2.33, p =.07; see Table 18 for regression coefficients.

Table 18

Hierarchical multiple regression analysis predicting change in BMI at six months from depression, binge eating, maximum lifetime weight, and self-compassion (N = 51)

		B	*SE*	*β*	*t*
Step 1					
	Constant	-.121	1.332		-.091
	Highest weight	.002	.011	.021	.142
	DASS-21-D	-.025	.075	-.049	-.332
	EDE-Q-14	.071	.076	.139	.943
Step 2					
	Constant	-4.74	2.05		-2.32*
	Highest weight	.004	.010	.061	.439
	DASS-21-D	.162	.096	.315	1.68
	EDE-Q-14	.119	.073	.232	1.64
	SCS - SF	.097	.034	.527	2.84**

Note. DASS-21-D = Depression Anxiety Stress Scale – Depression (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998); EDE-Q-14 = Eating Disorder Examination-Questionnaire (EDE-Q : Fairburn & Belgin, 1994); and the Self-Compassion Scale – Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011).

*p < .05, **p < .01

Taken together, correlational and regression analyses suggest that higher baseline shame (and specifically bodily shame) predicted greater *weight loss* at six months. Furthermore, higher baseline self-compassion was associated with greater *weight gain* at six months. These results were surprising and contrary to predictions. To further explore these findings, two open-ended questions that were posed to participants at the six month assessment were examined.

Qualitative responses regarding shame and weight at six months. To further shed light on relationships between shame and weight change, participants were asked to answer the question, 'How has shame helped or hindered your weight loss journey?" Their responses were examined using content analysis (Elo & Kyngäs, 2008). Overall, the main findings suggested that more participants found shame to be helpful rather than a hindrance for weight loss at six months. Eleven participants reported that shame helped with their weight loss. Almost all of these participants indicated that shame served as a motivator for engaging in exercise, self-monitoring, and healthy eating. Several participants indicated that bodily shame was specifically associated with greater shame.

Nine participants reported that shame hindered weight loss. These participants reported that shame triggered emotional eating, binge eating, and eating unhealthy foods. Several participants reported engaging in an emotional overeating/shame cycle and described how shame interfered with weight loss.

Two participants reported that shame both helps and hinders weight loss. Their responses pertained to shame serving as a motivator for resisting urges to overeat, and that shame may interfere with following a weight loss plan. Twenty-one participants reported that shame does not generally help or hinder their weight loss. Several

participants reported that they feel no shame. One participant indicated that feeling no shame relates to being healthy. Nine participants reported answers that were unclear. All responses and initial coding are presented in Appendix H.

Qualitative responses regarding self-compassion and weight at six months. At six months, self-compassion was largely viewed as being helpful for weight loss maintenance. Thirteen participants reported that self-compassion helped with weight loss. These participants reported that self-compassion was important for managing set-backs that occurred. Some participants stated that self-compassion helped to counterbalance self-criticism or shame, helped with motivation, and worked to create a positive self-image. Some participants stated that self-compassion was important for proper self-care.

Seven participants reported that self-compassion hindered weight loss. These participants reported that self-compassion gave them permission to indulge in unhealthy eating habits. They stated that self-compassion allowed them to make excuses for not sticking with a behavioural plan. Some participants stated that having 'too much' self-compassion is particularly problematic.

Twenty-two participants did not specifically state whether self-compassion was more of a help or hindrance for weight loss. Several participants reported other information not specifically related to self-compassion including: 1) self-care may not be a top priority; and 2) comparisons to others may occur during weight loss. Nine participants reported that self-compassion was generally not applicable to their weight loss journeys. All responses and initial coding are presented in Appendix I.

Taken together, results from the qualitative data suggest that, in the first six months after achieving at least a 5% weight loss, many individuals believe that shame

helped promote weight loss maintenance or further weight loss by serving as a motivator. Results further suggest that some participants believe self-compassion was important for recovering from setbacks; however, other participants associated self-compassion with self-indulgence and engaging in behaviours contrary to their weight loss plan. These results work to elucidate the quantitative findings in the current study, where higher baseline shame was associated with weight loss maintenance and higher baseline self-compassion was associated with weight regain at six months.

In examining the correlations between change in BMI, shame, and self-compassion over the twelve months of this study, it appears as if the association between the baseline shame or self-compassion and weight outcome may have been different at six versus twelve months. Therefore, hierarchical multiple regressions were conducted to examine whether baseline shame and self-compassion predicted weight outcome at twelve months.

Shame and change in BMI at twelve months. To examine the degree to which total baseline shame predicted change in BMI at twelve months, a hierarchical multiple regression was performed. The independent variable (shame) was initially assessed for collinearity. Results of the collinearity tolerance (.477) support that the estimated βs of the coefficients for the dependent variables were well established in all of the regression models. Change in BMI from baseline to twelve months was used as the dependent variable. Depression, binge eating, and maximum lifetime weight were entered as predictor variables in the first step. These variables accounted for 2.8% of the variance in BMI change at twelve months, F (3,49) = .47, p = .704. None of the variables

significantly contributed to the model. This step of the regression model was replicated in subsequent hierarchical regression analyses.

Baseline shame was entered in the second step of the regression analysis. Shame significantly accounted for an additional 10.7% of the variance in weight change, ΔF (1,48) = 5.96, p = .018. With the addition of shame to the model, depression became a statistically significant predictor (t = 2.06, p = .045), suggesting that shame is highly correlated with depression. The final model accounted for a total of 13.5% (F (4,48) = 1.88, p =.129) of variance in BMI change at twelve months, which was not statistically significant (see Table 19 for regression coefficients).

Table 19

Regression analyses predicting change in BMI at twelve months from depression, binge eating, maximum lifetime weight, and shame (N = 53)

		B	*SE*	*β*	*t*
Step 1					
	Constant	1.41	2.03		.698
	Highest weight	-.016	.017	-.137	-.955
	DASS-21-D	.047	.117	.057	.402
	EDE-Q-14	.039	.112	.049	.345
Step 2					
	Constant	4.04	2.211		1.83
	Highest weight	-.010	.016	-.081	-.586
	DASS-21-D	.332	.161	.404	2.06*
	EDE-Q-14	.065	.107	.083	.609
	EoS	-.085	.035	-.475	-2.44*

Note. DASS-21-D = Depression Anxiety Stress Scale – Depression (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998); EDE-Q-14 = Eating Disorder Examination-Questionnaire (EDE-Q : Fairburn & Belgin, 1994); and the Experience of Shame Scale (EoS; Andrews, Qian, & Valentine, 2002), *p < .05 (two-tailed).

To examine the degree to which the individual components of shame (i.e. characterological, behavioural, and bodily) predicted change in BMI at twelve months, a hierarchical multiple regression was performed (see Table 20 for regression coefficients). The independent variables were initially assessed for collinearity. Results of the collinearity tolerance (range = .447-.754) indicated that the estimated βs of the coefficients for the dependent variables were well established in the regression models. After completing the first step of the regression analysis, characterological shame, behavioural shame, and bodily shame were entered into the model. The addition of these variables accounted for an additional 11.8% of variance in BMI change which was not statistically significant, ΔF (3,46) = 2.11, p =.111. In examining the unique relationships between the individual components of shame and weight change at twelve months, none of the components were found to significantly contribute to the model. The total model accounted for 14.6% of the variance in BMI change at twelve months, F (6,46) = 1.31, p = .272. This indicates that by twelve months, none of the components of shame independently predicted weight change.

Table 20

Hierarchical regression predicting change in BMI at twelve months from depression, binge eating, maximum lifetime weight, characterological shame, behavioural shame, and bodily shame (N = 53)

		B	*SE*	*β*	*t*
Step 1					
	Constant	1.41	2.03		.698
	Highest weight	-.016	.017	-.137	-.955
	DASS-21-D	-.047	.117	.057	.402
	EDE-Q-14	.039	.112	.049	.345

Step 2				
	Constant	3.77	2.28	1.65
	Highest weight	-.006	.017	-.051	-.347
	DASS-21-D	.340	.178	.414	1.91
	EDE-Q-14	.071	.116	.091	.614
	EoS-C	-.131	.090	-.362	-1.46
	EoS-Be	-.018	.102	-.042	-.176
	EoS-Bo	-.122	.187	-.139	-.653

Note. DASS-21-D = Depression Anxiety Stress Scale – Depression (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998); EDE-Q-14 = Eating Disorder Examination-Questionnaire (EDE-Q : Fairburn & Belgin, 1994); EoS - C, Be, Bo = Experiences of Shame Scale – Characterological, Behavioural, and Bodily Shame (EoS; Andrews, Qian, & Valentine, 2002).

Self-compassion and change in BMI at twelve months. To examine the degree to which baseline self-compassion predicts change in BMI from baseline to twelve months, a hierarchical multiple regression was performed. The independent variable (self-compassion) was initially assessed for collinearity. Results of the collinearity tolerance (.614) support that the estimated βs of the coefficients for the dependent variables were well established in the regression models. After completing the first step of the regression analysis, self-compassion was entered into the model. Self-compassion accounted for an additional 5.5% of the variance in weight change, ΔF (1,48) = 2.86, p = .097. The final model accounted for a total of 8.3% of the variance in BMI change at twelve-months which was not statistically significant, F (4,48) = 1.08, p = .376; see Table 21 for regression coefficients. This indicates that, at twelve months, baseline self-compassion does not significantly predict weight change.

Table 21

Regression analyses predicting change in BMI at twelve months from depression, binge eating, maximum lifetime weight, and self-compassion (N = 52)

		B	*SE*	*β*	*t*
Step 1					
	Constant	1.41	2.03		.698
	Highest weight	-.016	.017	-.137	-.955
	DASS-21-D	.047	.117	.057	.402
	EDE-Q-14	.039	.112	.049	.345
Step 2					
	Constant	-2.50	3.05		-.818
	Highest weight	-.015	.016	-.129	-.913
	DASS-21-D	.196	.144	.238	1.35
	EDE-Q-14	.081	.113	.103	.720
	SCS - SF	.088	.052	.298	1.69

Note. DASS-21-D = Depression Anxiety Stress Scale – Depression (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998); EDE-Q-14 = Eating Disorder Examination-Questionnaire (EDE-Q : Fairburn & Belgin, 1994); and the Self-Compassion Scale – Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011).

*$p < .05$

Taken together, twelve-month regression analyses indicated that higher baseline shame still predicted weight loss and weight loss maintenance at twelve months follow-up; however, the strength of this relationship was weaker than it was at six months. Contrary to the findings from the six month regression analyses, bodily shame no longer predicted weight loss and weight loss maintenance at twelve months. Furthermore, self-compassion was no longer associated with weight regain at twelve months. To further explore these findings, two open-ended questions that were posed at twelve months were investigated using the same content analysis approach as at six months.

Qualitative responses regarding shame and weight at twelve months. At twelve months, more participants viewed shame as a hindrance for weight loss. As compared to six months, fewer participants indicated that shame serves a motivational role. Twelve participants reported that shame hindered their weight loss journey. Most of these participants reported that shame led to increased eating, poorer food choice, and interfered with health behaviours. Nine participants reported that shame helped with their weight loss. Most of these participants reported that shame served as a motivator for weight loss. One participant reported that shame both helped and hindered their weight loss. This participant stated shame contributed to overeating and feelings of helplessness, and also served as a source of inspiration. Sixteen participants reported that shame did not generally help or hinder their weight loss. Several of these participants reported that they felt no shame and that shame was unrelated to weight. Three participants reported answers that did not directly pertain to the posed question. However, all three of these participants reported that gaining back weight led to increased feelings of shame. All responses and initial coding are presented in Appendix J.

Qualitative responses regarding self-compassion and weight at twelve months. At twelve months, most participants reported that self-compassion was integral for weight loss maintenance. More participants indicated that self-compassion was helpful rather than a hindrance. As compared to six month responses, self-compassion was less associated with self-indulgence and "taking it easy." Twenty participants reported that self-compassion helped with their weight loss at twelve months. Participants reported that self-compassion is important when recovering from set-backs and that a lack of self-compassion relates to increased emotional eating, and feelings of guilt and shame. Two

participants reported that self-compassion hindered with their weight loss journey. One participant reported that self-compassion allows one to indulge in unhealthy eating. Eight participants reported answers that did not specifically state whether self-compassion was more of a help or hindrance for weight loss. Several participants noted that self-compassion is related to overall health, and that one can work on their self-compassion. One participant noted that a lack of self-compassion leads to increased guilt and shame. Ten participants reported that self-compassion was generally not applicable to their weight loss journey. All responses and initial coding are presented in Appendix K.

Summary of key findings from testing hypotheses one, two, and three. At six months, baseline shame was significantly associated with weight loss maintenance. However, by twelve months, although the relationship between baseline shame and weight loss maintenance was still significant, the strength of the relationship was weaker. At six months, more participants indicated that shame was helpful for weight loss maintenance (rather than a hindrance), and that shame served as a motivator to engage in weight loss behaviours. By twelve months, more participants indicated that shame was a hindrance for weight loss maintenance (rather than helpful), and they reported that shame promoted engagement in maladaptive behaviours that interfered with weight loss maintenance (e.g., overeating).

At six months, self-compassion was significantly associated with weight regain. However, by twelve months, self-compassion was no longer significantly associated with weight regain. At six months, more participants reported that self-compassion was helpful for weight loss maintenance (rather than a hindrance), and indicated that self-compassion helped with recovering from setbacks and maintaining weight loss

behaviours. However, a substantial minority of participants reported that self-compassion was related to self-indulgence and giving oneself permission to stray from a weight loss plan. By twelve months, the large majority of participants indicated that self-compassion was helpful (rather than a hindrance) for maintaining weight loss behaviours.

Taken together, the present findings suggest that shame and self-compassion may have differential effects on weight loss maintenance and weight regain at varying points in time. Following initial weight loss, shame demonstrates a strong relationship with increased weight loss at six months. However, this relationship attenuates by twelve months. Conversely, self-compassion demonstrates a strong relationship with weight regain at six months; however, this relationship disappears by twelve months.

Hypothesis four: Emotional eating mediates or moderates the relationship between shame and weight regain. Hypothesis four investigated whether emotional eating mediated or moderated the relationship between shame and weight regain. Planned analyses consisted of testing emotional eating as both a mediator and moderator of the relationship between shame and BMI change at six and twelve months. Prior to running these analyses, correlations between emotional eating and BMI change at all time points were calculated. Results indicated that emotional eating was not significantly related to BMI change over time. These results suggest that emotional eating may not mediate the proposed relationships. Results are presented in Table 22.

Table 22

Bivariate correlations between BMI change (Δ BMI), baseline emotional eating (EES), three month emotional eating (M3_EES) and six month emotional eating (M6_EES).

	Δ BMI B_M3 (*N* = 68)	Δ BMI M3_M6 (*N* = 51)	Δ BMI B_M6 (*N* = 52)	Δ BMI B_M12 (*N* = 53)
B_EES	-.039 (N = 61)	-.085 (N = 45)	.118 (N = 46)	-.066 (N = 48)
M3_EES	.056 (N = 56)	-.255 (N = 34)	.014 (N = 40)	-.209 (N = 44)
M6_EES	-.067 (N = 51)	-.270 (N = 42)	.065 (N = 51)	-.130 (N = 43)

Note. Δ BMI B_M3; baseline to three months, Δ BMI M3_M6; three months to six months,

Δ BMI B_M6; baseline to six months, Δ BMI B_M12; baseline to twelve months, and the Emotional Eating Scale (EES; Arnow et al., 1995).

Emotional eating as a mediator at six months. The proposed mediation model for weight regain at six months suggested that emotional eating at three months may mediate the relationship between baseline shame and change in BMI at six months. It was hypothesized that feelings of shame would lead to engaging in emotional eating (as a way to mitigate emotional distress) and that this would subsequently lead to increased weight gain at six months. The proposed mediation model for weight regain was tested using Baron and Kenny's (1986) steps for mediation analysis. In step one, a univariate linear regression was performed to determine the association between the independent variable (shame at baseline) and the outcome variable (change in BMI at six months). Maximum lifetime weight, depression, and binge eating were controlled by entering them in a first step in the regression as they have been shown to predict weight change in previous research. In step two, a univariate linear regression was performed to determine the association between the independent variable (shame at baseline) and the proposed

mediator (emotional eating at three months). In step three, a linear regression was performed to determine the effect of the proposed mediator (emotional eating at three months) on the dependent variable (change in BMI at six-months). Once again, maximum lifetime weight, depression, and binge eating were controlled by entering them in a first step in the regression equation. Shame was also entered in the first step of the regression to establish the unique effect of emotional eating on change in BMI. The purpose of steps 1-3 is to establish that zero-order relationships among the variables exist. If one of these steps is not significant, mediation is not possible or likely (Kenny, 2016).

Results from the regression analyses did not support the proposed mediation model. The independent variable (shame) significantly predicted both the proposed mediator (emotional eating; R = .278, F (1,54) = 4.53, p = .038) and the dependent variable (change in weight; R^2 change = .245, ΔF (1, 46) = 15.40, $p < .001$). However, the proposed mediator (emotional eating) did not significantly predict change in BMI at six months, R^2 change = .012, ΔF (1, 34) = .65, p = .426. These results suggest that emotional eating at three months did not mediate the relationship between baseline shame and change in BMI at six-months (see Figure 3).

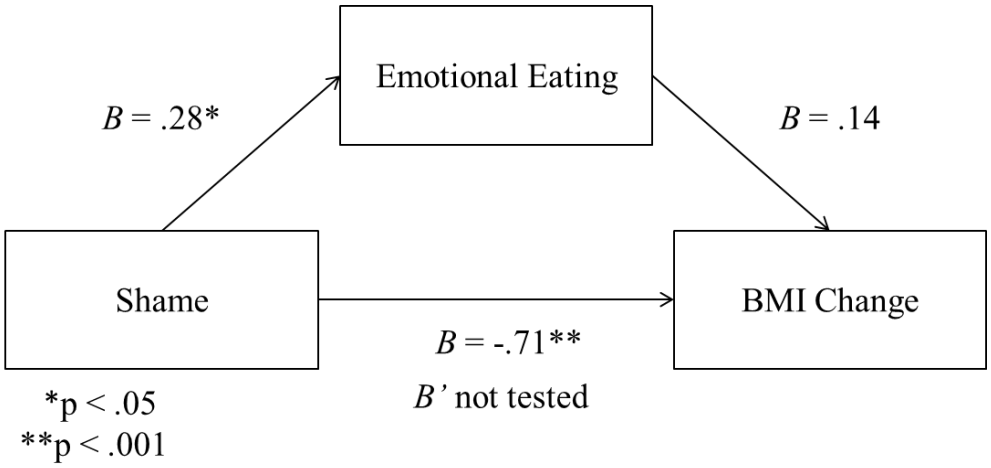


Figure 3. Standardized regression coefficients for the relationship between baseline shame and change in BMI at six months as mediated by emotional eating at three months.

Emotional eating as a moderator at six months. To investigate the role of emotional eating at baseline as a moderator of the relationship between baseline shame and BMI change at six months, a multiple regression model was employed. After centering emotional eating and shame, and computing the emotional eating- shame interaction term (Aiken & West, 1991), the two predictors and the interaction were entered into the regression model. Results indicated that neither emotional eating, shame, nor their interaction term was associated with BMI change at six months (see table 23).

Table 23

No significant interaction between baseline emotional eating and baseline shame in predicting weight regain at six-months (N = 46)

Independent	*B*	S.E.	β	*t*	R^2	ΔR^2	df	ΔF	Δp
Step 1					.060		2, 43	1.36	.267

EoS	-.006	.004	-.244	-1.650					
EES	2.536E-5	.004	.001	.007					
Step 2					.064	.004	1, 42	.190	.665
EoSxEES	.000	.000	-.071	-.436					

Note. EES = Emotional Eating Scale (Arnow, Kenardy, & Agras, 1994); EoS = Experience of Shame Scale (Andrews, Qian, & Valentine, 2002).

Emotional eating as a mediator at twelve months. The proposed mediation model for weight regain at twelve months was tested in the same manner (as the six-month model). Results from the regression analyses did not support the proposed model. The independent variable (baseline shame) did not significantly predict the proposed mediator (emotional eating at six months), R = .063, F (1,50) = .20, p = .659. Baseline shame accounted for a significant amount of additional variance the dependent variable (change in BMI at twelve months), R^2 change = .107, ΔF (1, 48) = 5.96, p = .018. The proposed mediator (emotional eating at six months) did not significantly predict change in BMI at twelve months, R^2 change = .029, ΔF (1, 37) = 1.40, p = .244. These results suggest that emotional eating does not mediate the relationship between baseline shame and change in BMI at twelve months (see Figure 4).

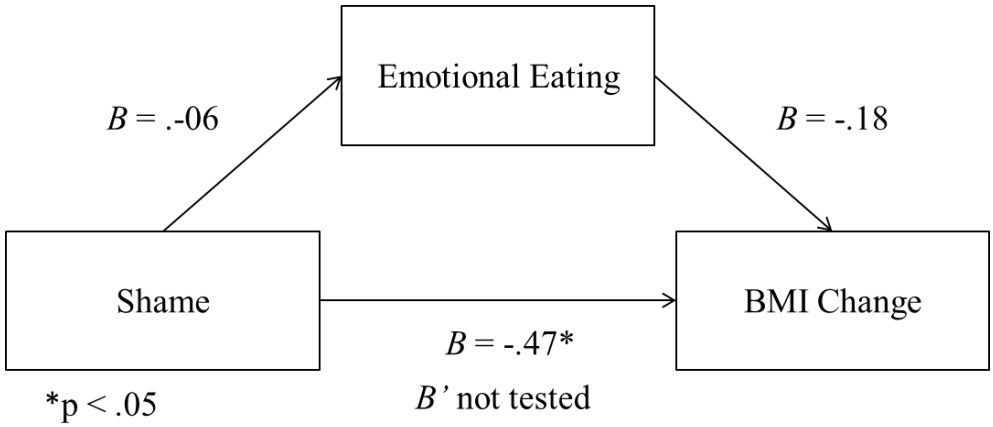


Figure 4. Standardized regression coefficients for the relationship between baseline shame and change in BMI at twelve months as mediated by emotional eating at six months.

Emotional eating as moderator at twelve months. A multiple regression model was used to investigate whether the association between shame at baseline and BMI change at twelve-months depends on the degree of emotional eating at baseline. After centering emotional eating and shame, and computing the emotional eating- shame interaction term (Aiken & West, 1991), the two predictors and the interaction were entered into the regression model. Results indicated that neither emotional eating nor shame were independently associated with BMI change. However, the interaction between emotional eating and shame was significant, suggesting that the relationship between baseline shame and weight regain depended on the degree of emotional eating at baseline (see Table 24).

Table 24

Significant interaction between baseline emotional eating and baseline shame in predicting weight regain at twelve months (N = 48)

Independent	*B*	S.E.	β	*t*	R^2	ΔR^2	df	ΔF	Δp
Step 1					.022		2,45	.511	.604
EoS	-.003	.004	-.136	-.920					
EES	.002	.003	.070	.477					
Step 2					.174	.152	1,44	8.11	.007
EoSxEES	.001	.000	.399	2.85*					

Note. EES = Emotional Eating Scale (Arnow, Kenardy, & Agras, 1994); EoS = Experience of Shame Scale (Andrews, Qian, & Valentine, 2002).

*p >.01

Simple slopes for the association between emotional eating and shame were tested for high (+1 SD above the mean) and low (-1 SD below the mean) levels of emotional eating. The high emotional eating simple slope test revealed a positive association between emotional eating and BMI change, suggesting that baseline shame was associated with weight regain at higher levels of emotional eating, b = .013, SEb = .007, β = .546, *p* =.054. The low emotional eating simple slope test revealed a significant negative association between emotional eating and BMI change, suggesting that baseline shame was associated with weight loss at lower levels of emotional eating, b = -.018, SEb = .006, β = .752, *p* =.005. Figure 5 plots the simple slopes for the interaction.

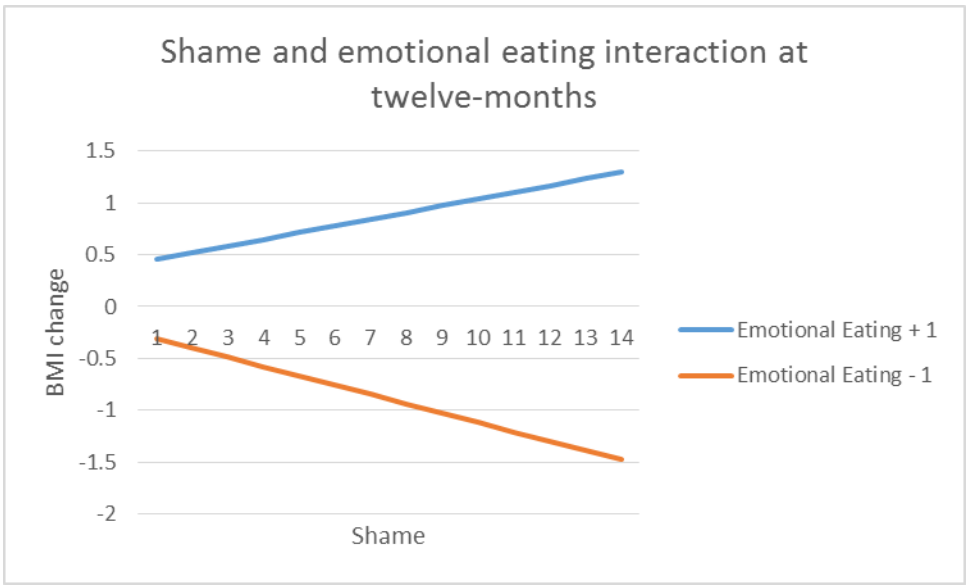


Figure 5. Simple slopes depicting interaction of baseline shame and baseline emotional eating at twelve-months.

Summary of the relationship between emotional eating and BMI change over time. Results from the mediation analyses indicated that emotional eating at three or six months does not explain the relationship between baseline shame and BMI change at six or twelve months, respectively. Results from the moderation analyses indicated that baseline emotional eating does not moderate the relationship between baseline shame and BMI change at six months; however, it does moderate the relationship between shame and BMI change at twelve months. Baseline shame was associated with weight regain at higher levels of baseline emotional eating, and weight loss at lower levels of baseline emotional eating.

Summary of Key Results

Overall, the results of the current study indicate that shame and self-compassion have differential effects on weight loss maintenance and weight regain at six and twelve

months. Results from correlational, regression, and qualitative analyses indicate that baseline shame demonstrates a stronger positive relationship with weight loss and weight loss maintenance shortly after weight loss. Over time, this relationship weakened. Conversely, self-compassion demonstrates a stronger positive relationship with weight regain shortly after weight loss. Over time, this relationship also weakened. Finally, moderation analyses suggest that the relationship between baseline shame and weight regain depended on participants' baseline levels of emotional eating, with baseline shame predicting weight regain at higher levels of emotional eating but predicting weight loss at lower levels of emotional eating.

Discussion

The purpose of this study was to investigate the roles of shame and self-compassion in predicting weight loss maintenance and weight regain in a community sample of obese persons who recently lost weight. It was hypothesized that shame would be positively related to weight regain and self-compassion would be positively related to weight loss maintenance. A mixed-methods longitudinal prospective cohort design was used to assess relationships between shame, self-compassion, and change in weight over time. Individuals from the community whose body mass index (BMI) fell within the obese range (i.e. BMI $\geq$ 30) and who intentionally lost at least 5% of their body weight through diet and exercise in the past four weeks were invited to take part in this study. At baseline, participants took part in biological and psychological assessments. Two similar follow-up assessments were conducted at six and twelve month follow-up. In addition, participants were also asked to self-report their weight and complete a measure assessing emotional eating at three month follow-up. Quantitative and qualitative analyses were performed to assess relationships between the key variables in question. The directionality of the findings was contrary to expectations, with baseline shame predicting weight loss at six and twelve months and baseline self-compassion predicting weight regain at six months. Emotional eating played a critical role in moderating relationships between shame and weight change, such that individuals with higher baseline shame and higher baseline emotional eating experienced weight regain over time whereas individuals with higher baseline shame and lower baseline emotional eating experienced continued weight loss over time. Overall, the current findings suggest that some high shame individuals in obese populations who are trying to maintain a weight

loss maintenance plan may benefit from compassion-focused therapy interventions that have been found to be effective in shame prone clinical populations. Findings are discussed in detail in the following sections.

Aims and Findings

Shame and self-compassion. Hypothesis one examined whether relationships between shame and self-compassion were consistent with Gilbert's (2005) biopsychosocial model of affect regulation. In this study, it was hypothesized that shame and self-compassion would demonstrate a negative relationship. In support of this hypothesis, correlations between total shame (and all components including characterological shame, behavioural shame, and bodily shame) and self-compassion were significantly and negatively related across all time points. These findings were supported by qualitative reports indicating that self-compassion counterbalances shame, and a lack of self-compassion results in greater shame. Results support previous research that shows strong negative relationships between shame and self-compassion in both community and clinical samples (e.g., Ferreira et al., 2013; Kelly et al., 2009).

Shame and weight change. Hypothesis two examined whether baseline shame relates to weight regain over time. Gilbert's (2005) biopsychosocial model of affect regulation proposes that there are three distinct affect regulation systems: the threat, soothing, and drive systems. The threat system is thought to be activated by negative external stimuli (e.g., criticism), resulting in negative emotions (e.g., shame). The clinical eating disorder literature suggests that individuals with bulimic symptoms are sensitive to criticism and frequently feel shame. They tend to use food to regulate negative affect and shame; however, their bulimic/binge eating behaviours lead to increased feelings of

shame making them vulnerable to further symptoms. Individuals with bulimia are considered to be stuck in a "shame-shame" cycle, where shame is reinforced by and reinforces bulimic/binge symptoms (Goss & Allan, 2014; Goss & Gilbert, 2002). This thesis drew from the clinical eating disorder literature to hypothesize that individuals with obesity struggling to maintain their weight loss may experience high levels of shame and engage in emotional eating to cope with their distress. However, the use of emotional eating may be experienced as shameful (due to straying from a behavioural weight loss plan); resulting in further emotional eating to manage heightened distress. Thus, it was predicted that higher baseline shame would predict weight regain over time.

Results were surprising and did not support the second hypothesis. It was found that higher baseline shame predicted weight loss at six months and twelve months rather than weight regain as expected. Interestingly however, the strength of the shame-weight loss relationship decreased over time. At six months, a substantial subgroup of participants reported that shame was helpful for weight loss and that it served as a motivator for weight loss. By twelve months, fewer participants reported that shame was helpful and most participants reported that shame was a hindrance for further weight loss. In general, higher baseline shame predicted greater weight loss maintenance over one year.

Bodily shame and weight change. Across all components of shame, bodily shame was most strongly associated with weight loss. At six months, higher baseline bodily shame independently predicted greater weight loss after controlling for depression, binge eating, and maximum lifetime weight. However, this association was not maintained at twelve months. This suggests that current bodily shame may be

specifically associated with weight change, and that current bodily shame may serve as a strong motivator for weight loss at least in the short term.

Among regainers, level of bodily shame did not change over time. Among non-regainers, bodily shame significantly decreased from baseline to six months and from baseline to twelve months. This indicates that as weight loss was maintained, bodily shame decreased.

Self-compassion and weight change. The aim of hypothesis three was to examine how baseline self-compassion related to weight change over time. Based on Gilbert's (2005) model, it was hypothesized that higher baseline self-compassion would predict greater weight loss maintenance over time. Contrary to expectations, at six months, higher baseline self-compassion was associated with and significantly predicted weight regain. In the qualitative data, most participants reported that self-compassion was helpful for weight loss maintenance; however, a subgroup of participants reported that self-compassion was a hindrance for weight loss maintenance as it gave them permission to indulge in unhealthy eating habits. By twelve months, higher baseline self-compassion was no longer associated with weight regain or weight loss. At twelve months, anecdotally, almost all participants reported that self-compassion was integral for weight loss maintenance and only two participants reported that self-compassion related to indulgence. Self-compassion did not significantly change over time for either regainers or non-regainers.

Shame, emotional eating, and weight change. The aim of hypothesis four was to investigate whether emotional eating mediated and/or moderated the hypothesized relationship between shame and weight regain. Previous research indicates strong

positive relationships between experiencing negative emotions, emotional eating, and weight (e.g., Lazarevich et al., 2016). Therefore, it was hypothesized that emotional eating may explain or affect the relationship between shame and weight regain. Emotional eating was tested as a mediator and moderator of the proposed relationship at six months and twelve months.

Emotional eating as a mediator. The proposed mediation model predicted that heightened feelings of shame may lead some participants to engage in emotional eating as a way to manage emotional distress, and that this would lead to future weight gain. It was hypothesized that emotional eating may explain how individuals experiencing shame would regain weight. The proposed mediation model for weight regain was tested using Baron and Kenny's (1986) steps for mediation analysis at both six months and twelve months.

Results from the regression analyses did not support the proposed mediation model. Emotional eating did not mediate the relationship between shame and change in BMI at six-months or twelve-months. This indicates that emotional eating did not explain the relationship between shame and weight change among obese persons over the one-year follow-up.

Emotional eating as a moderator. The proposed moderation model suggested that high or low levels of emotional eating may influence the relationship between shame and BMI change. In particular, it was hypothesized that shame would predict weight increase over time among those with higher (but not lower) levels of emotional eating at baseline. The proposed moderation models (i.e., at six and twelve months) were tested using multiple regression analyses. At six months, neither emotional eating, shame, nor

their interaction term (shame and emotional eating) were associated with BMI change at six months. At twelve months, neither predictor was associated with BMI change; however, the interaction term between emotional eating and shame was significant indicating that the relationship between baseline shame and weight regain at twelve months depended on the degree of emotional eating at baseline. Consistent with expectations, higher baseline shame predicted greater weight regain at one year follow-up among those with higher levels of baseline emotional eating. However, higher baseline shame predicted greater weight loss at one year among those with lower levels of baseline emotional eating. This suggests that high-shame individuals who present with higher levels of emotional eating shortly after weight loss are more likely to regain weight over time. This finding has important potential clinical implications for the treatment of obesity.

Findings Within the Context of Previous Research

To our knowledge, this was the first longitudinal study to examine the relationship between shame, self-compassion and weight outcome in obesity. This study found evidence that shame and self-compassion demonstrate a negative relationship within a community sample of obese person who recently lost at least 5% of their body weight. Findings provide further support for Gilbert's (2005) biopsychosocial model of affect regulation and related research indicating that individuals higher in shame are lower in self-compassion (e.g., Gilbert, 2011; Gilbert & Irons, 2005; Goss & Allan, 2014; Kelly et al., 2013).

Drawing from the clinical literature, it was thought that participants with higher baseline shame would be stuck in a "shame-shame" cycle, whereby feelings of shame

would reinforce and be reinforced by (over)eating behaviours (Goss & Allan, 2014; Goss & Gilbert, 2022). It was thought that this would lead to weight regain over time. Conversely, it was thought that participants with higher baseline self-compassion would be more likely to engage in weight loss behaviours over time and maintain their weight loss (Goss & Allen, 2014; Goss & Gilbert, 2002). However, certain findings were contrary to these expectations. In the short term, shame predicted weight loss maintenance and self-compassion predicted weight regain. These findings were unexpected and somewhat puzzling. Over time, the strength of the shame-weight loss relationship decreased and self-compassion no longer predicted weight loss or weight regain.

In hindsight, findings make sense in light of the sample characteristics. Prior to participating in the study, participants lost at least 5% of their body weight through weight loss behaviours, such as caloric restriction. During the study, participants indicated that they wanted to keep losing weight, and most participants maintained their weight loss for one year. This suggests that most participants demonstrated a high degree of control over their weight loss behaviours. The sample characteristics of these participants may have more closely resembled individuals who engage in more overcontrolled restrictive eating behaviours (as seen in anorexia nervosa) than more undercontrolled binge eating behaviours (as seen in bulimia nervosa). This suggests that Goss & Gilbert's (2002) "shame-shame" clinical model for bulimia may not have been appropriately applied to this sample.

Instead, Goss and Gilbert's (2002) "shame-pride" clinical model for anorexia may have been more applicable to this sample. This model suggests that among individuals

with anorexia, shame leads to restrictive behaviours and subsequent weight loss, and weight loss is positively reinforced by feelings of pride at least temporarily (Goss & Allan, 2014; Goss & Gilbert, 2002). In this study, most participants experienced weight loss maintenance. This suggests that for most participants, higher shame at baseline led to greater adherence to behavioural weight loss methods (e.g., restriction), and subsequent weight loss may have been reinforced by feelings of pride. The "shame-pride" clinical model associated with anorexia may better illustrate the shame-weight loss relationship found in this sample.

In addition, Goss and Gilbert's (2002) clinical models were developed to explain psychopathology. The sample in this study was recruited from the community, and individuals who were previously diagnosed with having an eating disorder were excluded from the study. It is possible that the clinical models were less applicable to the entire sample and more applicable to subgroups within the sample who presented with more disordered eating patterns.

Adhering to strict caloric restriction may also explain the particularly strong relationship between body shame and weight loss at six months. Recent research indicates that current body shame (experienced in relation to one's body) and anticipated body shame (if one were to gain weight) differentially predict disordered eating behaviours (Troop, Sotrilli, Serpell, & Treasure, 2006). Current body shame is a stronger predictor of binge eating, while anticipated bodily shame is a stronger predictor of emotions and behaviours related to avoidance of weight gain such as fasting and excessive exercise (Troop et al., 2006). It is possible that participants at baseline experienced higher degrees of anticipated body shame (e.g., "I worry I will regain weight

and look unattractive if I do not stick with my diet") relative to their current shame, as participants just recently lost weight. At baseline, high shame participants may have had a strong fear of weight regain that led to increased restriction and weight loss at six months.

By twelve months, bodily shame no longer predicted weight loss or weight regain. This suggests that baseline body shame might have differential effects on weight loss over time. In the short term, baseline body shame may serve as a motivator for engaging in weight loss behaviours. However, as weight loss is maintained, baseline body shame may no longer serve as a motivator for weight loss.

Although participants generally maintained their weight loss for one year, a subgroup of participants experienced weight regain at six months and at twelve months. It is possible that these participants were initially overly restricting their food intake and overate after a period of food deprivation (Herman & Mack, 1975). For these participants, maintaining a substantial caloric deficit for one year may have been too difficult. After a period of dieting, participants may have experienced disinhibition, engaged in overeating, and experienced weight regain.

At six months, higher baseline self-compassion predicted weight regain. Previous research indicates that lower self-compassion explains relationships between shame and body dissatisfaction, and a drive for thinness (Ferreira et al., 2013). This suggests that participants with higher baseline self-compassion may have had less motivation for thinness. Behaviourally, they may have been less adherent to their weight loss plans. Indeed, a substantial minority of participants at six months reported that self-compassion hindered their weight loss journey as it led to greater indulgence.

By twelve months, higher baseline self-compassion did not predict weight regain or weight loss maintenance. This finding may support previous research suggesting that baseline self-compassion predicts adherence to a behavioural plan (e.g., Dowd & Jung, 2017). In this study, participants higher in baseline self-compassion who experienced weight regain at six months may have flexibly adapted their weight loss behaviours to meet their desired weight loss goals; that is, participants higher in baseline self-compassion recognized that they were gaining weight, and modified their behaviours accordingly to meet their weight loss goals.

At twelve months, participants who experienced weight regain demonstrated higher levels of baseline shame and emotional eating. This finding was not surprising. Shame has been strongly related to emotional eating and binge eating in obesity (e.g., Wong & Qian, 2016). Among nonclinical women, emotional eating has been significantly related to bulimic symptoms but not anorexia symptoms (Waller & Osman, 1996), and eating more highly palatable foods to cope has predicted a corresponding increase in body weight among overweight and obese persons (Boggiano, Wenger, Turan, Tatum, Morgan, & Sylvester, 2015). This thesis ties together previous research and suggests that nonclinical individuals with high shame who engage in emotional eating experience weight regain over time.

Taken together, the findings of this thesis suggest that in the short term, higher baseline shame leads to greater weight loss and weight loss maintenance. However, the shame-weight loss relationship attenuates over time. As weight loss is maintained, factors other than baseline shame may become more important in maintaining weight loss (perhaps current pride in weight loss). In the long term, higher degrees of baseline

shame and baseline emotional eating lead to weight regain. Self-compassion may be important for long-term adherence to a weight loss plan, as individuals higher in self-compassion who experienced weight regain in the short term did not experience weight regain in the long term. This suggests that participants higher in self-compassion flexibly altered their behaviours to meet their weight loss goals. Results suggest that interventions from Compassion Focused Therapy (CFT) may be helpful in promoting weight loss maintenance among obese individuals trying to lose and maintain their weight loss.

Implications for Theory and Research

Baseline correlations provide support and the regression analyses at six and twelve months provide partial support for Gilbert's biopsychosocial model of affect regulation. Relationships between shame and self-compassion were negatively related over time, and several participants reported that self-compassion helps to counterbalance shame and a lack of self-compassion leads to shame. These findings corroborate Gilbert's claim that self-compassion is the antidote to shame. The relationships between shame and weight loss weakened over time and participants with high shame and high emotional eating regained weight over time. These findings support the application of CFT for Eating Disorders for subgroups in obese populations who struggle with shame and emotional eating. Findings pose interesting theoretical and research implications for CFT, shame, and self-compassion.

Implications for theory. CFT for Eating Disorders proposes that disordered eating behaviours, such as overeating, serve a self-protective function of temporarily reducing aversive emotions such as self-criticism and shame. However, these behaviours are maladaptive as they ultimately contribute to greater eating pathology (CFT-E: Goss

& Allan, 2014). The current study provides evidence that CFT may be applicable to subgroups in nonclinical obese populations trying to lose weight and maintain weight loss. For example, obese participants who experienced high shame and strong urges to engage in emotional eating gained weight over time; supporting the "shame-shame" cycle associated with overeating in bulimia (Goss & Gilbert, 2002). This suggests that the CFT model may provide an important framework for understanding weight loss and weight loss maintenance in both clinical and community populations.

Although the results of this thesis support the CFT model, the results also strongly suggest the importance of cautiously interpreting nonclinical findings when using a clinical model. Namely, adaptive behaviours in nonclinical populations may be maladaptive in clinical populations. In the weight loss literature, maintaining a diet is viewed as a positive accomplishment. In the eating disorders literature, dieting is viewed as a symptom of an eating disorder and therefore pathological. The importance of clearly conceptualizing behavioural outcomes when using clinical literature to explain nonclinical findings is vital.

Implications for research. The current sample was largely successful at maintaining their weight loss for a year, suggesting that participants were adherent to engaging in weight loss behaviours (i.e., diet, exercise, and/or self-monitoring). CFT proposes that highly self-critical individuals tend to use safety behaviours, such as self-monitoring, as a way to protect themselves from future threat (Gilbert, 2010). As applied to this thesis, it is possible that high shame participants engaged in greater degrees of self-monitoring as a safety behaviour to ensure that their weight loss was successful and future shame was avoided. Investigating the use of specific weight loss behaviours for

weight loss maintenance may provide a more nuanced understanding of how the CFT model specifically applies to this population.

At twelve months, total shame, body shame, and the strength of the shame-weight loss relationship decreased. This suggests that decreases in shame were associated with decreases in weight loss maintenance behaviours. This implies that higher levels of shame may serve as a stronger motivator for weight loss in obese populations. Recent research on self-criticism, an emotion that tends to co-occur with shame, has suggested that a form of self-criticism related to severe self-hatred may be more indicative of pathology (Baião, Gilbert, McEwan, & Carvalho, 2015; Gilbert, 2010). Investigating differences in the phenomenological experience of shame may further clarify its role across clinical and nonclinical weight loss populations.

Replicating this study and extending the follow-up time period may further clarify the roles of shame and self-compassion on weight change over time. In this study, the strength of the relationship between baseline shame and weight loss decreased from six months to twelve months. It would be interesting to investigate whether this trend continues or even reverses over time (e.g., perhaps baseline shame predicts weight regain at 24 months). Similarly, the strength of the relationship between baseline self-compassion and weight regain decreased over time and by twelve months was no longer significant. It would be interesting to investigate whether self-compassion predicts adherence to a weight loss maintenance plan in the longer-term.

Another interesting avenue for future research may be delineating the roles of shame versus guilt on eating behaviours. Guilt has been defined as an emotion of behavioural responsibility and is related to a tendency to repair past wrongs (Gilbert,

2010; Pivetti, Camodeca, & Rapino, 2016; Tagney & Dearing, 2002). Previous eating behaviours research conceptualized dietary restraint as the behavioural consequence of guilt. Dietary restriction has been seen as a coping effort to make up for past eating transgressions, such as overeating (Conradt et al., 2008). Investigating relationships between shame, guilt, and weight loss maintenance may help further clarify the role of shame on eating behaviours.

From a methodological perspective, the current findings suggest that cross-sectional research on shame and self-compassion using only one-time point captures only a limited perspective of each emotion. In this longitudinal study, the roles of shame and self-compassion changed over time. The manner in which participants understood each emotion, and the degree to which each emotion influenced weight change, fluctuated over time from baseline to twelve months. Results suggest that longitudinal research on shame and self-compassion using multiple time points is important to clarify the nuanced roles of each emotion.

Clinical Implications

Weight management interventions have traditionally focused on behavioural interventions including self-monitoring, reducing caloric intake, and physical activity (Wadden, 1995; Hill et al., 2005). This study provides evidence that emotions also play important roles in weight loss maintenance. Specifically, shame and self-compassion directly influence weight loss maintenance trajectories. These findings suggest that targeting shame and self-compassion in weight management treatment programs may have important outcomes for weight loss maintenance.

A subgroup of individuals demonstrated a positive relationship between shame and weight loss, and/or a negative relationship between self-compassion and weight loss. Clinically, these individuals may also benefit from CFT interventions. Although CFT acknowledges that shame-based self-attacking can serve as a motivator for accomplishing goals, it proposes that using this motivational system can be unpleasant. Thus, although shame-based self-attacking may lead to weight loss maintenance in the short term, bullying oneself into maintaining one's weight loss is likely to be highly unpleasant. As compassionate self-correction can also serve as a motivator for accomplishing goals, then a kinder self-to-self relationship may make the process of weight loss more enjoyable (Gilbert, 2010). Integrating compassion focused interventions into behavioural weight loss plans may help shame prone individuals achieve their weight loss maintenance goals in a more encouraging and supportive manner.

An important aim of integrating compassion focused interventions into behavioural weight loss plans is to de-shame obesity and promote wellness behaviours. Thus, CFT recommends that during case formulation individuals should be aware of: 1) innate and historical influence that give rise to key external and internal threats, 2) fears that give rise to externally and internally focused safety strategies, and 3) unintended consequences that fuel more distress, safety strategies, and difficulties (Gilbert, 2010). For individuals who are obese, results from this thesis suggest that their weight loss maintenance plan should address: 1) biological and social factors that lead to obesity and weight stigmatization, external shaming, and internal shame, 2) how shame can lead to more restriction or emotional eating to manage emotional distress, and 3) how this results in either increased weight loss that may or may not be tenable, or in increased weight

gain. CFT proposes that helping people gain a deeper understanding of why problems are "not their fault", while at the same time recognizing the importance of "taking responsibility", is fundamental to developing self-compassion (Gilbert, 2010). Individuals would then be encouraged to integrate compassion focused practices into their weight loss journey with the ultimate goal of using self-compassion and the soothing system, rather than shame and the threat system, for continued motivation for weight loss maintenance.

Finally, from a public health perspective, obesity interventions in the public health system are often designed for everyone. However, large scale interventions typically obscure important individual differences (Seeman & Lucini, 2011). Results from this study illustrate that there are distinct subgroups within obese populations that have particular challenges, such as emotional eating. This indicates that a "one-size-fits-all" obesity policy will not work and weight loss interventions should be individualized accordingly. Integrating compassion focused interventions into individual weight loss plans may help address the needs of distinct subgroups, particular those prone to self-criticism and shame, found within obese populations.

Study Strengths and Limitations

This study had a number of strengths. To our knowledge, this was the first longitudinal study assessing relationships between shame, self-compassion, and weight change. It was also the first study to apply Gilbert's (2005) biopsychosocial model of affect regulation to a sample of obese individuals attempting to lose weight, and to suggest that interventions from compassion focused therapy may be applicable for some individuals in the community struggling to maintain their weight loss. The use of a

longitudinal design is a major strength and allowed examination of relationships among variables over time. This project used both quantitative and qualitative methods to assess nuanced relationships between shame, self-compassion, and weight change. For most assessments, weight was objectively measured rather than self-reported; increasing the internal validity of the study results. The use of a community sample, rather than a clinic sample as in many previous studies, increased the generalizability of study results. The sample included both male and female participants, whereas many previous studies only recruited females. The sample size was also adequately powered to decrease the chances of a Type II error.

The limitations of this study are mostly methodological concerns. The sample size was relatively small, with approximately 50% of eligible participants choosing not to take part in the study. This suggests there may have been a sampling bias. Shame and self-compassion were not operationalized for participants in the qualitative component of the study. It is unclear how this affected participants' interpretation of the study questions. The time it took participants to lose 5% of their body weight or the methods they used to achieve their weight loss prior to enrolling in the study were not controlled for. Weight loss was self-reported and therefore there is the possibility of recall bias, as individuals who are overweight, obese, or engage in dieting practices have been found to underestimate or underreport their weight (e.g., Larsen et al., 2008; Lassale et al., 2013; McCabe et al., 2001). There may be salient differences between participants who took a long time versus a short time to lose weight. The emotional eating scale measures one's desire to eat, rather than the frequency of eating behaviours. This may have influenced the predictive validity of the emotional eating scale, such that some participants may

have experienced the urge to eat but did not engage in eating behaviours. A large proportion of participants had post-secondary degrees, possibility affecting the generalizability of the findings. Although the attrition rate of 25% at twelve months was similar to other long-term weight loss studies in obese adults (~30-60%; Douketis, Macie, Thabane, & Williamson, 2005), it may have further affected the generalizability of the findings such that participants who remained in the study may have differed across key variables than participants who dropped out of the study.

Despite these limitations, this study fills a gap in the literature by investigating relationships between shame, self-compassion, and weight change in an obese sample over time. The current findings provide partial support for Gilbert's (2005) biopsychosocial model of affect regulation and adds novel information to the weight loss maintenance literature.

Future Directions

This thesis suggests that integrating compassion focused interventions into behavioural weight loss plans may help individuals develop a kinder self-to-self relationship that may, in turn, serve as motivation for weight loss. However, it is very difficult to develop self-compassion for weight loss maintenance when obesity shaming is supported on a policy level (Seeman & Luciani, 2011). Obesity policy in dominant culture justifies shaming practices by claiming that agency exists within the individual; thus, the "fault" of being obese is placed squarely on the shoulders of obese individuals. This erroneous perspective suggests that obesity shaming is a natural consequence of "choosing" to be obese. It is not surprising that consequences of obesity shaming include

depression, anxiety, low self-esteem, suicidal behaviour, binge eating, and unhealthy eating among obese persons **(**Seeman & Luciani, 2011).

If self-compassion is the antidote to shame, cultivating a culture of compassion for obese persons is vital for targeting obesity shaming practices. Members of the dominant (i.e., non-obese) group have a vital role to play in cultivating compassion, as individuals or groups who feel shame feel less resilient, less empowered, and less able to give voice (Jordan, 2013). Challenging dominant discourse by targeting definitions imposed on the less powerful by the more powerful, and addressing the messages that make the less powerful "the problem", are vital conversations that need to occur to help change social and political discourse (Jordan, 2013). Targeting obesity shaming through policy change is integral for increasing compassion and self-compassion for individuals who are obese.

A final note. To be compassionate is to be tremendously courageous (Gilbert, 2010). Self-compassion work requires vulnerability in looking at parts of oneself that may be painful. Compassion work requires actively working against dominant discourses and powerful social tropes. It is important to support those who work towards increasing self-compassion or cultivating a culture of compassion, as it is their efforts that will help lead to a kinder, safer, and more peaceful world.

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Appendix A

Informed Consent Form

How Biological and Psychological Factors Influence Eating Behavior and Weight Loss

Consent to Take Part in Research

IINVESTIGATORS: Dr. Jacqueline Carter, Psychology Department, MUN
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You are invited to take part in a research project, and this form is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any other information given to you by the researcher.

It is entirely up to you to decide whether to take part in this research. If you choose not to take part or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

Introduction and Purpose:
We are conducting a research study to explore how psychological and biological factors affect eating behavior and body weight over time among people who have recently lost at least 10% of their body weight through diet and exercise. We are studying how different factors such as mood, personality, and the level of certain hormones affect weight loss maintenance .

We will measure weight-related hormones (e.g., leptin and ghrelin) secreted by various organs and tissues that affect appetite. In addition, we will examine if DNA sequences (i.e., genetics) affect weight loss maintenance. We are trying to understand how these biological factors work together with psychological factors to affect weight loss maintenance over time among people who have intentionally lost weight.

What you will do in this study:

This study will involve meeting with a research assistant at the Health Sciences Centre 3 times over the course of one year - an initial assessment and follow up appointments 6 and 12 months later. Each meeting will last about 1.5 hours. At the first visit, we will schedule your second and third follow-up appointments to take place 6 and 12 months later. Three months after your initial visit we will send you a very brief survey via e-mail to complete at home.

At the first appointment, you will be asked to provide a blood sample (approximately 3 tablespoons) so that we can measure the level of weight-related hormones and extract DNA from your blood. Next, you will be asked to fill out a few short questionnaires asking about your mood, personality, and eating behavior, and then complete a brief behavioral task on the computer. You will have your body weight and height, as well as body composition, measured by a certified staff member.

At the 6- and 12-month follow-up appointments, you will fill in a brief subset of the questionnaires, have your body composition measured again, and be asked to provide a blood sample.

Before each follow-up appointment, the researcher will contact you approximately one week prior to the scheduled meeting to confirm the time and date.

PARTICIPANTS ARE REQUIRED TO FAST FOR 12 HOURS (OVERNIGHT) PRIOR TO BLOOD SAMPLE This is necessary for the accurate measurement of weight-related hormones. If you do not wish to provide a blood sample and/or have your percent body fat measured, you may still participate in the other components of the study.

The results of this study are expected to contribute to the development of better weight loss treatments.

Possible benefits and risks: There are no known personal benefits guaranteed for participating in this study. However, it is possible that participation could assist your efforts to maintain weight loss over time. Possible risks associated with participation in this study are minimal, but may include some discomfort about revealing sensitive information about mood, eating behavior or weight history. There is little risk when sampling blood. There is a possibility of bruising at the site and a slight chance of infection. There will be a very low dose of X-ray exposure when you receive measurement of body fat.

<u>You should not participate in body composition measurement if you think you might be pregnant.</u>

Withdrawal from the study: You can withdraw from participation in this study at any point without giving any reason. There are no consequences for withdrawal. If you decide to withdraw, you will be given the opportunity to remove previously collected data from the study. Data cannot be withdrawn once the study has been completed and the results are aggregated.

Confidentiality and Anonymity: Your participation in this study will be kept strictly anonymous and confidential. The information gathered will be seen solely by the researchers involved in this study, and will be used solely for research purposes. Questionnaire data and blood samples will be identified only by ID number, and will not have any identifying information on them. Contact information and associated ID numbers will be kept in a separate secure digital file. This will allow the researchers to contact you to schedule follow up appointments, while keeping your information confidential and anonymous.

Confidentiality and Storage of Data: We will be collecting and storing questionnaire data via the online survey company FluidSurveys. As such, it is subject to Canadian privacy laws. If you choose to participate in this study, you understand that your responses will be stored in Canada. FluidSurveys ensures that they will not use the collected data, and that we, the researchers, retain ownership of it. The questionnaire data will be stored as a password protected digital file. The blood samples will be securely stored in Dr. Sun's laboratory. The blood samples will be identified only by ID number. Only Drs. Carter and Sun or researchers who signed the oath of confidentiality can access the data.

The security and privacy policies of FluidSurveys can be accessed at the following links:
http://fluidsurveys.com/about/privacy/
http://cdn1.fluidsurveys.com/wp-content/uploads/2013/02/FluidSurveys_Security2.pdf

Memorial University requires that the data be stored for a minimum of 5 years after publication of the study findings. The blood samples will be stored for at least 10 years because new hormones related to obesity might be available in the near future.

Reporting of Results: The findings from this study will be submitted for publication in academic journals and for presentation at scientific meetings. The data will be reported in group format only.

Sharing of Results with Participants: We would be happy to provide you with a summary of the research findings after this study is completed if you provide us with your e-mail address. Since this is a long-term project, this may be up to 5 years from now. Please indicate below if you would like to receive a summary of the research findings.

☐ I would like a summary of the research findings. E-mail:_____

Questions: You are welcome to ask any questions at any time during your participation in this research study. If you would like more information about this study, please contact Dr. Jacqueline Carter (contact information at the beginning of this form.)

Compensation: In the event that you suffer injury as a direct result of taking part in this study, necessary treatment will be available at no additional cost to you.

If you feel distressed after your participation in this study, you can contact one of the following resources:

For MUN Students: University Counselling Centre
5th Floor University Centre, UC-5000
Memorial University of Newfoundland St. John's, NL
A1C 5S7 Tel: (709) 864-8874

For Non-MUN students: Canadian Mental Health Association Crisis Line
Tel: (709) 737-4668
Toll Free: 1-888-737-4668

The protocol for this research study has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

Consent:
Your signature on this form means that:

- You have read the information about the research.
- You have been given the opportunity to ask questions about this study.
- You are satisfied with the answers to all your questions.
- You understand what the study is about and what you will be doing.
- You understand that you are free to withdraw from the study at any time, without having to give a reason, and that doing so will not affect you now or in the future.
- If you decide to withdraw, you will be given the opportunity to remove any previously collected data (including blood samples) from the study. Data cannot be removed once the study has been completed and the results are aggregated.
- For females – you are not pregnant.

If you sign this form, you do not give up your legal rights and do not release the researchers from their professional responsibilities.

Your signature:
I have read and understood what this study is about and appreciate any risks and benefits. I have had adequate time to think about this and have had the opportunity to ask questions and my questions have been answered.

☐ I agree to participate in the research project understanding the risks and contributions of my participation, that my participation is voluntary, and that I may end my participation at any time.

A copy of this Informed Consent Form has been given to me for my records.

_____ _____

Signature of participant Date

Researcher's or Research Assistant's Signature:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study, and he or she has freely chosen to be in the study.

_____ _____

Signature of Research Assistant Date

_____ _____

Signature of Researcher Date

Appendix B

Demographic Information Form

DEMOGRAPHIC INTERVIEW QUESTIONS

[PARTICIPANT ID:___]

Age:_____

Biological Sex: M F I

Relationship Status: _____

What is your ethnic background? _____

School/Vocational Functioning:
Do you work? Yes No
If yes, FULL TIME or PART TIME

What is your occupation? _____

Are you a student?: Yes No
If yes, FULL TIME or PART TIME

What is your highest level of education?
High School _____
College _____
University (undergraduate) _____
University (graduate) _____

WEIGHT HISTORY INTERVIEW QUESTIONS

Current Height: _____

Current Weight: ____

Are the above reports from measurements taken, or self-report? M__ SR___

If M, how much did you weigh last time you weighed yourself (SR)? _____
When was that?_____

When did you start trying to lose weight?_____
What was your weight when you started to lose weight this time? ____

Since you reached your current height:

What was your highest weight? (excluding pregnancy) ___

When was that?_____

How long were you at this weight? _____

What was your lowest weight?_____

When was that? _____

How long were you at this weight?_____

Appendix C

Depression, Anxiety, and Stress Scales, 21-item version (DASS-21).

Please read each statement and circle a number 0, 1, 2 or 3 that indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

0 = Did not apply to me at all
1 = Applied to me to some degree, or some of the time
2 = Applied to me to a considerable degree, or a good part of time
3 = Applied to me very much, or most of the time

1. I found it hard to wind down.
2. I was aware of dryness of my mouth.
3. I couldn't seem to experience any positive feeling at all.
4. I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion).
5. I found it difficult to work up the initiative to do things.
6. I tended to over-react to situations.
7. I experienced trembling (e.g., in the hands).
8. I felt that I was using a lot of nervous energy.
9. I was worried about situations in which I might panic and make a fool of myself.
10. I felt that I had nothing to look forward to.
11. I found myself getting agitated.
12. I found it difficult to relax.
13. I felt down-hearted and blue.
14. I was intolerant of anything that kept me from getting on with what I was doing.
15. I felt I was close to panic.
16. I was unable to become enthusiastic about anything.
17. I felt I wasn't worth much as a person.
18. I felt that I was rather touchy.
19. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat).
20. I felt scared without any good reason.
21. I felt that life was meaningless.

Appendix D

Eating Disorders Examination Questionnaire (EDE-Q)

EDE-Q5.2 Page 1

EATING QUESTIONNAIRE

Instructions: The following questions are concerned with the past four weeks (28 days) only. Please read each question carefully. Please answer all of the questions. Thank you.

Questions 1 to 12: Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days) only.

On how many of the past 28 days	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
1 Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
2 Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?	0	1	2	3	4	5	6
3 Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
4 Have you tried to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
5 Have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?	0	1	2	3	4	5	6
6 Have you had a definite desire to have a totally flat stomach?	0	1	2	3	4	5	6
7 Has thinking about food, eating or calories made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
8 Has thinking about shape or weight made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
9 Have you had a definite fear of losing control over eating?	0	1	2	3	4	5	6
10 Have you had a definite fear that you might gain weight?	0	1	2	3	4	5	6
11 Have you felt fat?	0	1	2	3	4	5	6
12 Have you had a strong desire to lose weight?	0	1	2	3	4	5	6

Questions 13-18: Please fill in the appropriate number in the boxes on the right. Remember that the questions only refer to the past four weeks (28 days).

Over the past four weeks (28 days) .....

13 Over the past 28 days, how many times have you eaten what other people would regard as an unusually large amount of food (given the circumstances)? .....

14 ..... On how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)? .....

15 Over the past 28 days, on how many **DAYS** have such episodes of overeating occurred (i.e., you have eaten an unusually large amount of food and have had a sense of loss of control at the time)? .....

16 Over the past 28 days, how many times have you made yourself sick (vomit) as a means of controlling your shape or weight? .....

17 Over the past 28 days, how many times have you taken laxatives as a means of controlling your shape or weight? .....

18 Over the past 28 days, how many times have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape or amount of fat, or to burn off calories? .....

Questions 19 to 21: Please circle the appropriate number. Please note that for these questions the term "binge eating" means eating what others would regard as an unusually large amount of food for the circumstances, accompanied by a sense of having lost control over eating.

19 Over the past 28 days, on how many days have you eaten in secret (ie, furtively)? ..... Do not count episodes of binge eating	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
	0	1	2	3	4	5	6
20 On what proportion of the times that you have eaten have you felt guilty (felt that you've done wrong) because of its effect on your shape or weight? ..... Do not count episodes of binge eating	None of the times	A few of the times	Less than half	Half of the times	More than half	Most of the time	Every time
	0	1	2	3	4	5	6
21 Over the past 28 days, how concerned have you been about other people seeing you eat? ..... Do not count episodes of binge eating	Not at all		Slightly		Moderately		Markedly
	0	1	2	3	4	5	6

Appendix E

Experience of Shame Scale (EoS)

Everybody at times can feel embarrassed, self-conscious or ashamed. These questions are about such feelings if they have occurred **at any time in the past month.** There are no 'right or 'wrong answers. Please indicate the response which applies to you with a tick.

	Not at all	**A little**	**Moderately**	**Very much**
1. Have you felt ashamed of any of your personal habits?				
2. Have you worried about what other people think of any of your personal habits?				
3. Have you tried to cover up or conceal any of your personal habits?				
4. Have you felt ashamed of your manner with others?				
5. Have you worried about what other people think of your manner with others?				
6. Have you avoided people because of your manner?				
7. Have you felt ashamed of the sort of person you are?				
8. Have you worried about what other people think of the sort of person you are?				
9. Have you tried to conceal from others the sort of person you are?				
10. Have you felt ashamed of your ability to do things?				

11. Have you worried about what other people think of your ability to do things?				
12. Have you avoided people because of your inability to do things?				
13. Do you feel ashamed when you do something wrong?				
14. Have you worried about what other people think of you when you do something wrong?				
15. Have you tried to cover up or conceal things you felt ashamed of having done?				
16. Have you felt ashamed when you said something stupid?				
17. Have you worried about what other people think of you when you said something stupid?				
18. Have you avoided contact with anyone who knew you said something stupid?				
19. Have you felt ashamed when you failed in a competitive situation?				
20. Have you worried about what other people think of you when you failed in a competitive situation?				

21. Have you avoided people who have seen you fail?				
22. Have you felt ashamed of your body or any part of it?				
23. Have you worried about what other people think of your appearance?				
24. Have you avoided looking at yourself in the mirror?				
25. Have you wanted to hide or conceal your body or any part of it?				

Appendix F

Self-Compassion Scale – Short Form (SCS-SF)

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

Almost never				**Almost always**
1	**2**	**3**	**4**	**5**

_____1. When I fail at something important to me I become consumed by feelings of inadequacy.

_____2. I try to be understanding and patient towards those aspects of my personality I don't like.

_____3. When something painful happens I try to take a balanced view of the situation.

_____4. When I'm feeling down, I tend to feel like most other people are probably happier than I am.

_____5. I try to see my failings as part of the human condition.

_____6. When I'm going through a very hard time, I give myself the caring and tenderness I need.

_____7. When something upsets me I try to keep my emotions in balance.

_____8. When I fail at something that's important to me, I tend to feel alone in my failure

_____9. When I'm feeling down I tend to obsess and fixate on everything that's wrong.

_____10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.

_____11. I'm disapproving and judgmental about my own flaws and inadequacies.

_____12. I'm intolerant and impatient towards those aspects of my personality I don't like.

Appendix G

Emotional Eating Scale (EES)

We all respond to different emotions in different ways. Some types of feelings lead people to experience an urge to eat. Please indicate the extent to which the following feelings lead you to feel an urge to eat.

	No Desire to Eat	A Small Desire to Eat	A Moderate Desire to Eat	A Strong Urge to Eat	An Overwhelming Urge to Eat
Resentful					
Discouraged					
Shaky					
Worn Out					
Inadequate					
Excited					
Rebellion					
Blue					
Jittery					
Sad					
Uneasy					
Irritated					
Jealous					
Worried					
Frustrated					
Lonely					
Furious					
On edge					
Confused					
Nervous					
Angry					

Guilty					
Bored					
Helpless					
Upset					

Appendix H

Qualitative Responses for Shame at Six Months

"How has shame helped or hindered your weight loss journey?" (N = 52)

Response	**Initial Coding**	**Group**
Keeps me from overeating/ eating junk food.	Motivator for not overeating/eating junk	Helped
Motivation to change	Motivator	Helped
Helped		Helped
Possibly a small amount of shame that I had gained a little bit of weight, which increased motivation to get active more.	Motivator for exercise Higher weight related to more shame	Helped
Its a motivator for me to watch what I eat, and stop making excuses about why I am not doing things like exercising.	Motivator for self-monitoring and exercise	Helped
When I am embarrassed how others may see me, that is motivation to lose weight	Motivator Bodily shame	Helped
Realizing that I put on 10 lbs served as encouragement.	Motivator	Helped
Shame can be a useful tool - after a cheat meal it can motivate you to refocus	Motivator Works after eating to help refocus	Helped
Has been a minor motivator in the sense that I was a little uncomfortable being undressed in public in the past but as I have lost weight that has diminished.	Motivator Bodily shame Shame decreases as one loses weight.	Helped
Helped. If I don't get enough exercise in a day or if I feel like I	Motivator for exercise	Helped

didn't eat well I feel bad. This motivates me to go to the gym or to try to do better.		
Pushes me to continue my weight loss	Motivator	Helped
		Help = 11
Hindered - The more you stray from weight loss, the shame to "see how far you've strayed"; Helped - Prevented from overindulging in certain situations	Motivator for not overeating Hinder: feels bad, is a sign of failure	Help and Hinder
both, i'm ashamed i'm fat and ashamed people are paying attention to me having lost weight	Feelings of shame do not depend on weight	Help and Hinder
		Help/Hinder = 2
irrelevant - I've dispensed with it. It does more harm than good.	Harmful Can get rid of feelings of shame	Hinder
the more junk I ate, the worse I felt and the more I ate! its been a terrible cycle in the last 3 months.	Triggers overeating unhealthy food Cycle	Hinder
shame hinders my weight loss		Hinder
has hindered in the past; am trying not to let it affect me	Interfers with weight loss journey Something to be avoided	Hinder
hindered - I constantly felt a "what's the point" feeling towards myself	Makes one feel hopeless	Hinder
Slows process not feeling comfortable doing full range of excercises	Slows process Self-conscious	Hinder
Hindered, when I think about my weight I feel poorly and tend to eat	Triggers emotional eating	Hinder

worse		
It only ads to the over eating. Feel shame/guilt eat more, feel guilt/shame so, eat more.	Triggers emotional overeating Cycle	Hinder
eat more	Triggers eating	Hinder
		Hinder = 9
I'm uncomfortable with my loose skin. Making me look heavier than I am, and hurting my self confidence considerably	Impacts body image and self-confidence	Unclear
Enjoying social events.		Unclear
afraid of gaining weight back		Unclear
a lot		Unclear
I am not ashamed of my body but I am driven to achieve my dream body.	Motivator ?	Unclear
slightly		Unclear
yes, sometimes		Unclear
Uncomfortable running in hot weather with clothes that cover		Unclear
Caused some stress	Emotional distress	Unclear
		Unclear = 9
No effect		N/A
Not really affected me.		N/A
Not at all		N/A
doesn't seem to be a factor that I can tell		N/A

N/A		N/A
n/a		N/A
No		N/A
Don't know		N/A
Not an issue		N/A
Not a great deal		N/A
I don't feel shame.	Don’t feel shame	N/A
neither, I am not ashamed about my weight, I got here because of 2 pregnancies and I will lose the excess	Don’t feel shame reason not to (pregnancy)	N/A
Not at all		N/A
Not at all.		N/A
Not at all.		N/A
I feel no shame - I am healthy	Don’t feel shame No shame = health	N/A
Little, though i am sure it was a slight factor		N/A
Not at all - dont feel shame	Don’t feel shame	N/A
i do not feel ashamed anymore about myself.	Don’t feel shame Because lost weight?	N/A
I don't feel ashamed	Don’t feel shame	N/A
not at all		N/A
		N/A = 21

Appendix I

Qualitative Responses for Self-Compassion at Six Months

"How has self-compassion helped or hindered your weight loss journey?" (N = 51)

Response	**Coding**	**Group**
Critical. Without it and its companion, self-forgiveness, it's impossible to pick up and keep going through the hard times or set-backs.	Managing set-backs	Helped
helped, I am dedicated to taking the time for me to be healthy.	Prioritizing self-care	Helped
Helped		Helped
helped, i'm not so hard on myself for eating	Counterbalance self-criticism	Helped
helps me with weight loss - I am compassionate with myself when i don't have the weight loss i want	Managing set-backs	Helped
Has been very helpful. I have been working on my compassion for self and others. It works as a counterbalance for shame.	Counterbalance for shame	Helped
helped - I know it's been a hard few months but I will get past this and I am trying to not obsess over the few pounds I have gained	Managing set-backs	Helped
Helpful if I give myself a break emotionally and not judge myself I can get motivated easier	Helps with motivation Counterbalance to self-criticism	Helped

Helped - I forgive myself when I slip off track	Managing set-backs	Helped
helped		Helped
Helped.		Helped
I have always tried to be objective and self aware and as such while recognizing that I had personality traits that were unproductive or even harmful at times such as my eating and activity levels, this never translated into a negative judgement about myself as a person. I've never felt that I did not deserve to be healthy or look a certain way so in that sense self-compassion has been a positive factor.	Creating positive self-image	Helped
I'm big on this - comes from my yoga practice. I try to be very kind to myself - it's key to being able to take proper care of myself with my health concerns.	Helps with self-care	Helped
		Help = 13
Hinders. Self-compassion is the voice that says "it's ok to eat sweets, you deserve it" when I really shouldn't	Permission to indulge Triggers unhealthy eating Make excuses for not sticking with behavioural change	Hinder
Hindered - I can be very self-critical, and that can spiral downward quickly.		Hinder
Allowing myself to indulge.	Permission to indulge Triggers unhealthy eating	Hinder

not being firm enough with myself; too much compassion	Interferes with sticking with behavioural change Too much is a hindrance	Hinder
hindered - I would sometimes punish myself with food		Hinder
Some times too forgiving.	Too much is a hindrance	Hinder
make excuses	Make excuses for not sticking with behavioural change	Hinder
		Hinder = 7
No idea		Unclear
not sure		Unclear
?		Unclear
unknown		Unclear
Once in a while I'll give myself break and try to break the negative self talk. I'll focus on what I have accomplished and start from there...	Counterbalances negative self-talk	Unclear
I am living a healthier life because it make me feel good.		Unclear
I am not sure if self-compassion is related to self-care but I generally put myself last in my family. I would take care of the needs of my children and my grandchild before myself. I think this interferes with time and the first thing I generally drop is exercise.	Self-care is not a priority	Unclear
I do try to take it easy on myself sometimes by not overworking or overtraining.	Taking it easy on self	Unclear

a lot		Unclear
I do understand of myself that loosing weight is not higher on the priority list than succeeding at parenting or self employment so losing weight makes it to the top of the priority list only at certain times of the year	Self-care is not a priority	Unclear
I want the very best for myself.		Unclear
YES		Unclear
greatly		Unclear
I am very hard on myself in everything I do		Unclear
I often compare myself to friends who are larger or smaller than I am. I want to be healthy and fit.	Comparison to others	Unclear
I really try not to compare myself to others	Comparison to others	Unclear
I've wished I could look like the other people i've seen who have lost 100 pounds.	Comparison to others	Unclear
No		Unclear
i feel better about myself.		Unclear
?		Unclear
Slightly Too hard and critical of myself		Unclear
No Compassion, my internal dialogue is pretty mean. It falls back to the eat/guilt/eat cycle.	Without compassion, feel guilt which leads to emotional eating.	Unclear

		Unclear = 22
Not applicable		N/A
Little impact		N/A
Little		N/A
Not at all		N/A
Had very little to do with weight loss or gain.		N/A
I'm not sure this has had an effect either way.		N/A
n/a		N/A
Not an issue		N/A
No influence.		N/A
		N/A = 9

Appendix J

Qualitative Responses for Shame at Twelve Months

"How has shame helped or hindered your weight loss journey?" (N = 41)

Response	**Coding**	**Group**
Sometimes I find this actually helps because it gets me back on track when I have periods where I'm not eating 100% healthy.	Motivator	Helped
A definite motivator. (Swimsuits especially)	Motivator	Helped
Helped		Helped
Helped		Helped
Helped		Helped
Helped		Helped
Helped		Helped
Hasn't been a significant factor, perhaps a small motivator.	Motivator	Helped
helped		Helped
		Help = 9
Has caused overeating and feeling of helplessness at times. Source of inspiration at other times.		Help and Hinder
		Help/Hinder = 1
Hindered (shame in lapsing	Interferes with health behaviours	Hinder

activity prevents me from joining back up)		
this has played a big role i have gained weight, the more i gain, the worse i feel, the more i eat. its a viscous cycle	Leads to increased eating	Hinder
Shame has hindered my weight loss in the past; I try not to let myself feel that way and that has helped.		Hinder
When I feel ashamed for my eating patterns I tend to eat worse.	Leads to poorer eating choices	Hinder
hindered		Hinder
hiding what I eat, hindered		Hinder
Poor food choices -> cravings -> more poor food choices -> repeat.	Leads to poorer eating choices	Hinder
Hindered - I am ashamed that I have gained much of the weight back. Sometimes this makes it hard to get back on track.	Interferes with health behaviours	Hinder
hindered		Hinder
hindered - when i feel bad about myself i eat	Leads to increased eating	Hinder
when I feel this way, I tend to eat more	Leads to increased eating	Hinder
Sabotages and leads to emotional eating	Leads to increased eating	Hinder
		Hinder =12
Not sure. Would be	Gaining back weight leads to feelings of	

embarrassed to gain back weight that I worked so hard to lose.	shame	Unclear
I have gained some of my weight back from my previous weight loss last year which causes negative emotions but nothing too s	Gaining back weight leads to feelings of shame	Unclear
Having lost about 75 lbs, I am embarrassed by even a few pounds up.	Gaining back weight leads to feelings of shame	Unclear
		Unclear =3
irrelevant. I decided some time ago that there was no point to this so I've let it go.		N/A
NA		N/A
didn't help nor hinder		N/A
not at all		N/A
Hasn't really affected me		N/A
No		N/A
Not a factor.		N/A
no factor		N/A
N/A		N/A
Not applicable.		N/A
neither		N/A
I don't usually associate shame with my weight.	Not associated with weight	N/A
I feel frustrated about my	Not associated with weight	N/A

weight gain but not shameful		
No effect		N/A
There is no shame, I can only do so much everyday and other issues have arose	No shame	N/A
No impact		N/A
		N/A = 16

Appendix K

Qualitative Reponses for Self-Compassion at Twelve Months

"How has self-compassion helped or hindered your weight loss journey?" (N = 40)

Response	**Coding**	**Group**
Helped		Helped
Helped		Helped
Helped. I am learning to be more easy on myself when I don't workout or eat healthy for a while. Makes it easier for me to get back into my program.	Recover from set-back	Helped
Essential. Everyone makes mistakes and fails. It's how we learn. To make real progress, you have to allow yourself to fail and really be okay with that.	Recover from set-back	Helped
I can find some form of compassion now and it has helped.		Helped
Helped. No one can be perfect all the time, but when I slip up I just make a plan to redeem myself. Being hard on myself won't help me keep on track.	Recover from set-back	Helped
Has helped me to avoid shame, and realize that if I make a mistake I can just pick back up and not necessarily spiral out of control.	Recover from set-back Without it, leads to shame	Helped
helped		Helped

Helped - always helps!		Helped
Helps get out of a craving cycle	Important	Helped
helped		Helped
helped		Helped
helped, I can go easy on myself because I've worked hard	Self-indulgence	Helped
helped		Helped
helped - when i give myself permission to fail a little i stay motivated	Motivator	Helped
I am still hard on myself and it works against me, when it come to staying on track.	Recover from set-back	Helped
Usually lacking and goes hand in hand with shame and leads to overeating	Without it, leads to guilt and shame	Helped
Better I'm not so hard on myself	Recover from set-back	Helped
I am being hard on myself regarding my weight, makes me feel worse and turn to food for comfort!	Without it, leads to emotional eating	Helped
Hindered (lack of self-compassion at times)		Helped
		Help = 20
This is more of a hindrance, it's the voice that says "have a donut, you had a hard day"... etc.	Self-indulgence	Hindered

hindered		Hindered
		Hinder = 2
somewhat... I want to be as fit or more so than my peers	Comparison to others	Unclear
?		Unclear
okay		Unclear
I've moved a lot since August 2014. First from St. John's to Illinois and then five months later to California. I'm giving myself a break for not exercising as much or finding a routine. This is a big step for me. I'm allowing myself to relax while being healthy.	Compatible with health	Unclear
I'm not great at self compassion but I am working on it	Important Can work on it	Unclear
I'm very hard on myself leading to guilt and shame	Without it, leads to guilt and shame	Unclear
I haven't been beating myself up too badly :-)		Unclear
I love myself and am taking the time to make sure I am healthy in all aspects	Relates to overall health Can prioritize it	Unclear
		Unclear = 8
n/a		N/A
n/a		N/A
Hasn't really affected me		N/A

No		N/A
didn't help nor hinder		N/A
no		N/A
Neither hindered nor helped.		N/A
N/A		N/A
no factor		N/A
I generally have positive feelings about myself and feel I deserve to be happy and healthy. As such I don't think this is a barrier to weight loss or weight control but I don't feel it is especially motivating either.		N/A
		N/A = 10

Appendix L

Twelve Month Weight Report Email

Dear (Participant),

Thank you so much for participating in our study on weight loss. Our goal with this research project is to understand better what predicts weight loss outcomes so that we can develop more effective interventions.

We are sorry that you were unable to attend your 12-month follow-up appointment.

It would help us greatly in interpreting our results if you could possibly send us your current weight by replying to this e-mail?

Thanks again for your help with this study.

Best wishes,

(Primary Researcher)